Draft Technical Memorandum
Phase I, Round II
Groundwater Monitoring
Vasquez Boulevard and
Interstate 70 (VBI70)
Operable Unit 3 (OU3)
Denver, Colorado

September 13, 2004

Knight Piésold
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Phase I, Round II
Groundwater Monitoring
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Operable Unit 3 (OU3)
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September 13, 2004

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List of Abbreviations and Acronyms

bgs	below ground surface
CLP	Contract Laboratory Program
DI	deonized

List of Abbreviations and Acronyms (Continued)

EDD	Electronic Data Deliverable
EPA	U.S. Environmental Protection Agency
FSR	March, 2004 Round 1 Field Sampling Report
GPS	Global Positioning System
Knight Piésold	Knight Piésold and Co.
MCL	Maximum Contaminant Level
OU3	Operable Unit 3
pdf	postscript document format
PE	Performance Evaluation
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SB	soil boring
SOP	Standard Operating Procedure
SRC	Syracuse Research Corporation
STL	Severn Trent Laboratories
UNCC	Utility Notification Center of Colorado
VB170	Vasquez Boulevard and Interstate 70

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1.0 Introduction

This technical memorandum describes installation of groundwater monitoring and observation holes (i.e., temporary monitoring wells) and three months of data collection performed during the Remedial Investigation (RI) for the Vasquez Boulevard and Interstate 70 (VBI70), Denver Colorado, Operable Unit 3 (OU3) former Argo Smelter Site. Unless otherwise noted, all activities were conducted in accordance with the Standard Operating Procedures (SOP) provided in Attachment D of the "Final Quality Assurance Project Plan and Sampling and Analysis Plan to Support Human and Ecological Risk Assessment and Remedial Investigation" (QAPP/SAP) (EPA, 2003). The field tasks and data collection described here are efforts completed from April 2004 through July 2004 for Round 2 of the Phase I portion of the RI.

Section 2.0 describes the rationale for the temporary monitoring well locations and details concerning utilities clearances and location surveying. Information pertaining to utilities clearance is provided in Appendix A. Appendix B provides copies of "Notice of Intent to Construct Monitoring Hole(s)" and "Well Construction Test Reports" filed with the Colorado State Engineer's office. Appendix C provides a report of the surveyed monitoring well locations. Procedures for well installation using direct-push drilling are described in Section 3.0. Boring logs and well construction diagrams are provided in Appendix D. Groundwater monitoring procedures, including water level measurements, field parameter measurements, and sample collection, are described in Section 4.0. Reporting of laboratory analytical data is described in Section 5.0. Table 1 summarizes sample locations, dates, and samples collected. Table 2 provides data summary reports for all samples. Laboratory reports with analytical results are provided on a CD-ROM in Appendix E. The CD-ROM in Appendix E also contains electronic spreadsheets from the sample location survey and digital files of all photos taken during the well installations.

Installation of five temporary monitoring wells took place on April 8, 2004. The field contractor (Kumar and Associates, Englewood, Colorado), arranged for the drilling subcontractor and

provided an environmental scientist to prepare boring and well construction logs. The drilling subcontractor (ESN Rocky Mountain, Golden, Colorado) provided a heavy-duty, truck-mounted, direct-push drill rig and two drilling personnel. Knight Piésold personnel were present to oversee the hydrogeological investigation and to ensure that field activities were in conformance with the QAPP/SAP (EPA, 2003).

Groundwater monitoring was conducted by Knight Piésold personnel. Measurements of water levels in the wells were initiated on April 27, 2004, and collection of water samples began on May 3, 2004. Results of three months of groundwater monitoring – May, June, and July of 2004 – are reported here. Fifteen groundwater samples were collected from all of the five wells. Also collected were four Quality Assurance/Quality Control (QA/QC) samples. Section 6.0 provides a summary of important findings and preliminary interpretation of the groundwater monitoring data. Table 3 provides a summary of the groundwater chemical concentrations found to exceed the U.S. Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL) concentrations.

2.0 Designation of Monitoring Well Locations, Utilities Clearance, and Final Location Survey

Figure 1 presents an updated version of "Figure – Phase 1 Soil Boring Locations" presented in the Phase 1, Round 1, Field Sampling Report (FSR) (Knight Piésold, 2004) issued March 4, 2004. In the figure, Round 1 soil boring locations as originally specified in the QAPP/SAP are indicated along with the actual surveyed locations. Locations SB-04 and SB-07, where Round 1 perched groundwater samples were collected, are indicated with asterisk symbols. Final locations of the Round 2 temporary monitoring wells are also indicated.

2.1 Rationale for Monitoring Well Locations

As described in Section 7 of the FSR (Knight Piésold, 2004), perched groundwater samples obtained within the former smelter site (i.e., the historic building footprints) were determined to be from localized pockets of groundwater within old and new fill materials. A regional groundwater aquifer was not identified anywhere within the study area (OU3). However, a potential shallow, unconfined groundwater aquifer was identified downslope to the east of the former smelter site, although no groundwater was observed in December of 2003. Toward the west, the potential aquifer appeared to consist of newer fill materials grading into or intermingling with older contaminated fill materials associated with the smelter. Toward the east, the fill appeared to be clean, newer, and overlying a basal layer of natural alluvium. The potential aquifer required further investigation to better determine the lithologic materials (fill and/or alluvium) and to determine whether groundwater might be present during wetter periods of the year.

The Round 1 soil and groundwater results were reviewed in a meeting with the U.S. EPA and the CDPHE on March 11, 2004. At that time, it was decided that the samples of perched groundwater from within the former smelter site had some metals concentrations that were sufficiently high to be of concern if the perched water could migrate off site. Installation of temporary monitoring wells was recommended to better characterize and monitor the potential aquifer in anticipation of the upcoming seasonal period of likely maximum rainfall.

During subsequent discussions with the EPA CDPHE, five monitoring well locations were chosen to monitor the potential aquifer, monitor the eastern site project boundary, and allow

determination of groundwater flow gradients should groundwater develop within the potential aquifer. The wells were located as follows:

- MW-32: East (downslope) of boring SB-32 where potential aquifer materials were considered to possibly slope downward from beneath the Village Inn parking lot toward the grounds of the Best Western Motel
- MW-33 and MW-34: Further east (downslope) in likely alluvial aquifer materials (wet gravel) beneath the parking lots of the Best Western Motel, identified at borings SB-33 and SB-34
- MW-35 and MW-36: Further east (downslope) at the eastern boundary of OU3 in potential aquifer materials observed at borings SB-35 and SB-36

2.2 Utilities Clearance and Final Location Survey

All wells were installed at locations covered under existing Voluntary Access Agreements (Access Agreements) which are contained in Appendix A of the FSR (Knight Piésold, 2004). Underground utilities were located and marked by UtiliQuest. Diversified Underground Inc., a private underground locator service, was used to locate utilities on private property on the grounds of the Village Inn, Best Western Motel, and Salvation Army. Utility clearance documents were kept with the field crew during drilling and sampling activities and are included in Appendix A.

Monitoring wells were installed following Colorado rules and regulations for monitoring hole/well construction (2 CCR 402-2). Notices of intent to construction monitoring hole(s) were filed with the Colorado State Engineer's Office prior to installation of the wells. Well construction test reports were provided to the State Engineer's Office after well installation (Appendix B). It is anticipated that the temporary wells will be abandoned within one year of installation and that monitoring well permits will not be required.

After well installation was completed, the well coordinates were recorded with a handheld Global Positioning System (GPS) receiver and provided to the surveyor. A survey of the final locations for horizontal and vertical coordinates was completed by Foresight West Surveying, Inc., a Colorado-licensed surveyor. The survey report is reproduced in Appendix C. The surveyor also provided the results in electronic spreadsheet format, and these are included on the data CD in Appendix E.

3.0 Well Installation Using Direct-Push Drilling

The drilling subcontractor, ESN Rocky Mountain, Golden, Colorado, provided a heavy-duty, truck-mounted, direct-push drill rig (AMS Power Probe 9600), waste containers, decontamination equipment, and groundwater pumping equipment. The direct-push drilling and sampling system was a dual tube system that allowed for collection of continuous core samples. The drilling procedures are described in detail in the FSR (Knight Piésold, 2004).

Five monitoring wells – MW-32, MW-33, MW-34, MW-35, and MW-36 – were installed on April 8, 2004. The depths of well installation ranged from about 10 to 20 feet into unconsolidated aquifer materials (fill, alluvium) overlying a claystone bedrock aquitard layer. MW-34 was the only well in which groundwater was encountered during installation. Three of the wells were installed through asphalt by cutting openings using a 10-inch-diameter circular saw. Direct-push borings were advanced using 3¼ -inch-diameter outer casing surrounding 2-inch-diameter acetate liners to collect continuous cores. As the cores were retrieved, they were placed on a table and the plastic liners cut open lengthwise to expose the core. The cores were examined by the Knight Piésold geologist. Boring logs and well construction diagrams were prepared by the Kumar and Associates environmental scientist.

Boring logs are provided in Appendix D. The "Extent" column on the log indicates the depth of advancement of the dual tube assembly (5-foot lengths). The "% Recovery" column on the log represents the length of core recovered in the liner divided by the length of "Extent." A recovery of less than 100 percent occurs when coarse particles obstruct entry of soil into the liner. A measure taken to minimize loss of loose, granular core was to use liners with flexible plastic tabs at the lower end that retain soil from falling under gravity.

The monitoring wells were constructed by lowering 5- or 10-foot lengths of 2-inch diameter polyvinyl chloride (PVC) screen and blank casing into the outer drilling casing. The well screens are factory-slotted, 0.010-inch, Schedule 40 PVC. The well screens were set into the claystone bedrock or into bentonite poured into the bottom of the boring to adjust the height of the bottom of the well screens. The outer drilling casing was retracted. The annular space was filled by pouring 10/20 Colorado Silica Sand into the boring to a height of 2 feet above the top of the screen. An exception was at MW-32 where bentonite was placed immediately above the screen to allow for a 3-foot thickness of bentonite/concrete seal to the surface. The sand pack was overlain by granular bentonite which was hydrated at intervals as it was poured. Flush-mount

wells were fitted with traffic-capable vaults set into concrete from 10 inches below ground surface (bgs). MW-34 was constructed with a steel riser set into concrete from 6 inches bgs. All wells have a minimum 3-foot thickness of bentonite/concrete beneath the surface and are fitted with locking caps. Well construction diagrams are provided on the boring logs in Appendix D.

4.0 Groundwater Monitoring

4.1 Water Level Measurements

The wells were installed on April 8, 2004. Water levels in all wells were first checked on April 27, 2004. The water levels were measured to the nearest 0.01 foot with an electronic sounder. Initially, measurable groundwater was observed only at MW-33 although moisture on the sounder probe tip suggested that slight amounts of water were present in MW-34 and MW-35.

Over the week of May 9-16, 2004, considerable rain (approximately at least one inch) was known to have fallen over the site, and the water levels were checked again on May 18, 2004. Three additional wells – MW-34, MW-35, and MW-36 – were found to have measurable water levels. MW-32 remained dry on that date.

The five wells were checked for the June and July monthly monitoring on July 1 and July 28, 2004. Starting July 1, 2004, all five wells, including MW-32 for the first time, were found to contain water.

The water level (depth to water) measurements are subtracted from the surveyed measuring points at each well to determine groundwater elevations in feet above mean sea level (amsl). The water levels and calculated groundwater elevations are reported for each groundwater sample in Tables 1 and 2. Additional findings from the water level measurements concerning the presence or absence of measurable saturated thicknesses in the aquifer materials are described in Section 6.0.

4.2 Establishing Monitoring Well Performance and Purging Procedures

On May 3, 2004, water levels were measured throughout pumping and sampling MW-33 to establish the performance of the well. It was determined that the well could be pumped slowly (using a peristaltic pump) with little decline in water level and that, in future sampling events, the well should be purged three casing volumes prior to sampling.

Monitoring wells MW-33, MW-34, MW-35, and MW-36 were sampled on Friday, May 21, and/or Monday, May 24, 2004. Water levels were monitored during pumping and sampling to establish the performance of wells MW-34, MW-35, and MW-36, which were pumped dry. It

was found that these wells did not exhibit substantial recovery over periods of up to an hour. The weekend of May 22-23, 2004 was used to test a longer period of recovery. It was determined that the allowing a period of two days would not guarantee sufficeint water for complete samples. In order to efficiently sample MW-34, MW-35, and MW-36, it was determined that the wells should be pumped dry without prior purging, and samples should be taken from the pumped water.

Monitoring of water levels during pumping and sampling of MW-32 on July 1, 2004 determined that it fell into the group of wells that could be pumped dry with little immediate recovery and that samples should be taken from the pumped water without prior purging.

4.3 Groundwater Sampling

Groundwater was sampled using a peristaltic sampling pump with new, 3/8-inch polyethelyene tubing at each well. The short length of flexible tubing at the pump head was decontaminated after each use by multiple rinses with distilled water. As described above, only MW-33 could be purged three casing volumes prior to sampling. The other wells were pumped dry and the samples collected from pumped water.

Groundwater field parameters measured during sampling were pH, conductivity, and temperature. The field parameters were measured by placing water in a plastic beaker and immersing the two probes (pH and conductivity/temperature) into the filled beaker. Field parameter measurements associated with each groundwater sample are reported in Table 2.

The pH and conductivity probes were calibrated at the start of each day and checked periodically throughout the day. The probes maintained their calibrations within ±0.1 log units and 10 percent of conductivity standard values. The probes were decontaminated after each use by multiple rinses with distilled water.

A filtered (0.45-micron) groundwater sample was first collected using either an in-line filter or a vacuum flask. The filtered groundwater was placed into 500-milliliter pre-acidified sample containers. An unfiltered groundwater sample was then collected into another pre-acidified container. The groundwater samples were placed in iced coolers. At the end of each day, chain-of-custody forms were completed and the samples delivered to the laboratory.

At MW-35 and MW-36, sample yields were low, less than about 250 milliliters (ml), and priority was given to obtaining the dissolved fraction only. At these wells, water used for field parameter determinations was also used to fill the sample containers. At MW-32, MW-33 and MW-34 sample yields were higher, sufficient to obtain double sample volumes for both the dissolved and total fractions. At MW-32 and MW-34, sample containers were filled as the wells were pumped dry without prior purging. At MW-33, the recovery was sufficient that the well was always purged 3 casing volumes prior to sampling

For the May 2004 monitoring event, six groundwater samples were collected as follows (see also Table 1): two from MW-33 (May 3 and May 21), one from MW-34 (May 21), one from MW-35 (May 24), and two from MW-36 (May 21 and May 24). MW-32 was dry and was not sampled.

For the June 2004 monitoring event (July 1, 2004), four groundwater samples were collected as follows (see also Table 1): one each from MW-32, MW-33, MW-34, and MW-36. MW-35 contained a small volume of water (approximately 0.27 feet or about 160 ml) which was considered an insufficient volume to sample.

For the July 2004 monitoring event (July 28, 2004), five groundwater samples were collected, one each from MW-32, MW-33, MW-34, MW-35, and MW-36 (Table 1). As before, MW-35 contained a small amount of water (approximately 0.22 feet or about 130 ml) but was sampled despite having insufficient volume. MW-35 had sufficient volume for two of three analytical procedures (mercury was not analyzed).

5.0 Analytical Data

5.1 General Procedures

On December 3, 2003, Knight Piésold personnel met with the Severn Trent Laboratories' (STL), Arvada, Colorado, laboratory project manager to provide a copy of the QAPP/SAP (EPA, 2003) and review project procedures. This review is summarized in the FSR (Knight Piésold, 2004). Standard laboratory reporting requirements are "CLP-like" format in lieu of the laboratory standard format. Data were also received as an Electronic Data Deliverable (EDD) in the form of a comma-delimited, double-quoted, ASCII text file for each of four laboratory projects.

To assist with data validation, reports of the raw analytical data for each laboratory project were also requested from STL. The laboratory reports and raw data reports were received in hard copy format and provided to Syracuse Research Corporation (SRC) on August 26, 2004 for final data validation. All reports were also received as electronic files in postscript document format (pdf). The pdf files and EDDs are provided on CD-ROM in Appendix E.

STL provided sample coolers, pre-acidified 500-milliliter containers for groundwater and rinseate blank samples and reagent water for rinseate blank samples. Throughout the course of the project, all chain-of-custody, preservation, sample volume, and holding time requirements were met.

Data summary reports shown in Tables 2, and 3 were prepared by importing the EDDs into a Microsoft Access database.

5.2 Field Quality Assurance/Quality Control Sample Collection

5.2.1 Equipment Rinseate Blank Samples

Field equipment rinseate blank (ERB) QA/QC samples were collected to verify the equipment decontamination procedures. Reagent quality deionized (DI) water was provided by the laboratory. After decontamination, the DI water was pumped through the peristaltic pump head, rinsed over the field parameter probes, and placed into a pre-acidified sample container. Because trace metals were not found in the field ERB samples, separate field blank samples were not collected.

The field ERB samples were submitted blind to the laboratory under the sample label MW-31 (Table 1). Analytical results are shown in Table 2.

5.2.2 Field Split Samples

Field split (duplicate) water samples were not collected due to the low sample volumes available at four of the five wells. Because the typical sampling procedure required collecting water progressively withdrawn as the well was pumped dry, the groundwater samples are expected to be inhomogeneous.

5.2.3 Performance Evaluation Standard Samples

A water matrix Performance Evaluation (PE) sample was submitted during the July monthly sampling event. The PE standard was obtained from SRC and identified as 7-B (12-16-03) (Table 1). Approximately 350 milliliters was poured from the one-liter bottle into a sample container. The sample container was pre-acidified, so the acid was discarded and it is assumed that the few drops of acid remaining in the sample bottle did not significantly dilute the PE standard concentrations. The PE sample was submitted blind to the laboratory as an unknown groundwater sample under the sample label MW-30 (Table 1). Analytical results are shown in Table 2.

6.0 Summary of Important Findings and Preliminary Data Interpretation

6.1 Aquifer Delineation and Groundwater Elevations

As described in Section 2.0 and also the FSR (Knight Piésold, 2004), perched groundwater was found at two locations within the former smelter site (i.e, the historic building footprints). The groundwater was determined to be from localized pockets perched within old and new fill materials. A regional groundwater aquifer was not identified beneath the former smelter site. However, a potential shallow, unconfined groundwater aquifer was identified to the east of the smelter site, although in December of 2003 no groundwater was observed. The potential aquifer consists of layers of fill and/or moist, silty and clayey sand overlying potentially transmissive moist to wet gravelly sand, likely alluvium, overlying claystone bedrock.

6.1.1 Perched Groundwater Beneath the Smelter Site

It is likely that the smelter site and perched groundwater system are located upon a natural stream terrace associated with the South Platte River system. If this is the case, excavations associated with construction (the smelter, the interstate highways, the industrial park) apparently removed natural alluvium that may have existed on the smelter site terrace. Fill materials are the only likely aquifer materials that were identified in the perched aquifer system. As described below, MW-32 was installed in fill materials that do not appear to be directly connected to the shallow potential aquifer to the east. It is considered that MW-32 monitors the eastern edge of the perched groundwater system in fill materials that extends to the west beneath the smelter site.

Monitoring well MW-32 was installed about 75 feet to the east (downslope) of soil boring SB-32 where the potential aquifer would likely slope downward from beneath the Village Inn parking lot toward alluvium identified beneath the grounds of the Best Western Hotel. During installation of MW-32, the claystone bedrock surface was found to exhibit little slope between SB-32 and MW-32 (claystone in both borings at approximately 5,203 feet amsl). The claystone bedrock appears to have the form of a flat terrace, or possibly an excavated escarpment. East of MW-32, there is apparently an abrupt 21-foot drop in elevation to SB-33/MW-33 (claystone in both borings at approximately 5,182 feet amsl).

The boring at MW-32 was logged and found to consist of newer, clean fill overlying claystone bedrock; natural alluvium was not identified (Appendix B). In retrospect, a 1- to 2-foot layer of

slightly sandy clay (SC) identified at SB-32 (Appendix D, Knight Piésold, 2004) can be interpreted to be newer fill and not alluvium. Using gravelly sand (GP or SP) or silty sand (SP or SM), but not clayey sand (SC), to identify alluvium, 31 boring logs in the FSR (Knight Piésold, 2004) indicate that there are no locations with alluvium from borings SB-32 and MW-32 to the western site boundary. A minor exception is at boring location SB-10, at the far west end of the site, where silty sand (SM) was identified from about 0.5 to 2 feet bgs.

In December of 2003, the elevations of the perched groundwater beneath the former smelter site were approximately 5,210 ft amsl at SB-04 and approximately 5,203 feet amsl at SB-07. In June and July, 2004, the groundwater elevations in MW-32 ranged from approximately 5,202 to 5,204 feet amsl. The groundwater elevations at MW-32 are at the lower end of the range of the perched water elevations.

There were no indications for perched groundwater in soil borings west of the former smelter site (i.e., SB-28, SB-29, SB-30, SB-31) and in the portions of the former smelter site south of Interstate 70 (i.e., SB-23, SB-24, SB,25, SB-26, and SB-27) (see Figure 1 and Appendix D in Knight Piésold, 2004). The areal extent of the perched aquifer system is estimated as the approximate area of the former smelter site north of Interstate 70, extending east to the estimated location of the terrace/escarpment near MW-32. Referring to Figure 1, the total estimated area where perched groundwater might be present is roughly bounded on the west by SB-10, on the south by SB-21, on the north by SB-01, and on the east by MW-32. This area forms a rectangle approximately 1,400 feet east-west by 750 feet north-south (Figure 1).

6.1.2 Alluvial Aquifer East of the Smelter Site

Natural alluvium was consistently observed in all borings east of the terrace or escarpment near SB-32 and MW-32. It is likely that this alluvium was deposited upon a natural stream terrace associated with the South Platte River system. If so, this second terrace with alluvium is about 20 feet lower in elevation than the terrace/escarpment associated with the former smelter site. Alluvium was identified in SB-33/MW-33, SB-34/MW-34, SB-35/MW-35, MW-36, and SB-37 (Appendix C and see also Appendix D in Knight Piésold, 2004). It is noted that during installation of monitoring wells MW-35 and MW-36 the core logging (Appendix C) improved the definition of alluvium versus fill compared to that presented in the FSR at SB-35 and SB-36 (Apendix D in Knight Piésold, 2004).

In June and July 2004, the water levels and calculated groundwater elevations at the four monitoring wells installed through alluvium were as follows:

Well	Date	Depth to Bedrock (ft bgs)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)
MW-33	7/1/04	16.5	15.6	5,183.1
	7.28.94	16.5	15.7	5,183.0
MW-34	7/1/04	20.2	20.0	5,179.8
	7/28/04	20.2	19.8	5,180.0
MW-35	7/1/04	11.0	No sample	-
	7/28/04	11.0	11.2	5,167.1
MW-36	7/1/04	8.0	8.9	5,166.5
	7/28/04	8.0	8.4	5,166.4

At MW-35 and MW-36, the depths to the top of bedrock are about 11.0 and 8.0 ft bgs, respectively (Appendix B). As shown in the above table, the depths to water were always greater than the depths to bedrock. In these wells, water apparently trickles down into the sump formed where the bottom of the well screen sits within the top of the claystone bedrock. The water levels therefore never rose above the top of bedrock, producing a measurable saturated thickness in the alluvium. This is consistent with the very low volumes of recharge to the wells, measured on the order of less than a liter per day, established as described in Section 4.2.

At MW-33, the elevation of the top of claystone bedrock is about 16.5 ft bgs (Appendix B). The maximum saturated thickness of the alluvium above the claystone was about 0.9 feet (i.e., 16.5 ft bgs - 15.6 ft bgs = 0.9 feet saturated). Similarly at MW-34, where the depth to the top of claystone bedrock is 20.2 ft bgs (Appendix B), the maximum saturated thickness of the alluvium was about 0.4 feet. Therefore, there is evidence that a small saturated zone develops temporarily, for at least part of the year, in the area of MW-33 and MW-34 beneath the parking lot of the Best Western Hotel. However, there are no indications of a water table connecting the saturated zone at MW-33 and MW-34 with the perched system to the west (at MW-32) or to the wells at the eastern site boundary (at MW-35 and MW-36).

It is recommended that monitoring of water levels in the wells be continued throughout the Fall of 2004 to verify the above observations and also to determine whether the groundwater system again goes completely dry at MW-33 and MW-34.

6.2 Groundwater Chemical Concentrations

Groundwater chemical data (December, 2003) reported in the FSR (Knight Piésold, 2004) indicated that the dissolved metals fraction in perched groundwater from beneath the former smelter site had concentrations of arsenic, cadmium, and zinc that exceeded primary MCLs. Table 2 provides a summary of all May-July, 2004 groundwater sampling results. Table 3 provides a summary of results of the groundwater sampling for metals concentrations greater than MCLs. Cadmium in the dissolved metals fraction exceeded the primary MCL of 5 micrograms per liter at MW-33, MW-34 and MW-36. Cadmium was also present at a concentration of 13 micrograms per liter at MW-32 in the total metals fraction, but was below the MCL in the dissolved fraction. The samples from MW-35 (dissolved metals only) showed no concentrations exceeding the MCLs.

The cadmium data suggest that the former smelter site is the source of cadmium in downgradient/downslope monitoring wells. The wells define three general areas where cadmium has migrated: 1) to MW-32 in the newer fill perched at the edge of the upper terrace/escarpment, 2) to the temporarily saturated zone that develops in alluvium at MW-33 and MW-34, and 3) further east to the thin seam of alluvium at MW-36 at the eastern site boundary.

There is no direct evidence that groundwater flow is presently occuring from the perched system beneath the former smelter site. The monitoring to date has not found evidence for hydraulic connection between the three general areas. Such evidence would include identification of a continuous water table or correlated variations in water levels. Conceptually, it can be proposed that small volumes of groundwater are currently migrating east from the perched system to the lower saturated zone, and then further east to the site boundary, but the exact pathways have not been identified. For example, the pathway cannot be through MW-32 because the saturated zone at MW-33 and MW-34 developed before groundwater appeared at MW-32. Similarly, very small (less than a liter per day) volumes of water are known to appear at MW-36 (Section 4.2), but a larger volume pathway escaping the saturated zone cannot be ruled out.

An alternative conceptual process (to groundwater flow presently occuring) is one where prior periods of groundwater flow (and possibly surface water runoff) developed a metals load that moved downgradient/downslope from the smelter site into the fill and aquifer materials where the wells are installed. The present monitoring data can also be explained as dissolution of metals when groundwater temporarily saturates the previously contaminated aquifer and fill materials.

6.3 Calculations for Groundwater Flux and Volume

Data are available to provide two estimates for groundwater flow. The first is a Darcian flux estimate based on observations of gradient and saturated thickness at MW-33 and MW-34. The second is an upper bound estimate of groundwater volume based on assuming an amount of precipitation over a recharge area.

MW-33 and MW-34 were the only locations with measurable saturated thicknesses, which were 0.4 to 0.9 feet, as described in Section 6.1.2. The formula for Darcian flux is Q = kiA, where Q is the flux in units of cubic feet per day, k is the saturated hydraulic conductivity (units of feet per day), and A is the saturated area, and i is the gradient (dimensionless). Measured values of hydraulic conductivity for nearby terrace alluvium (at the Globe Smelter site) range from about 1 to 10 feet per day (TRC, 1988). The gradient and flow direction between MW-33 and MW-34 cannot be accurately determined without a third groundwater elevation location, but the gradient may be constrained to range from about 0.005 to 0.008 (ft/ft) using the July, 2004 water elevation data described in Section 6.1.2. Assuming a 500 foot length for the saturated zone beneath the Best Western Hotel parking lot, the total estimated flux through the area monitored by MW-33 and MW-34 is estimated at between 1 and 4 cubic feet per day.

For the groundwater volume estimate, the recharge area may be taken to be the entire area over which perched water may occur, about 1,050,000 square feet, as described in Section 6.1.1. For every foot of precipitation on an annual basis, the volume of water is 2,875 cubic feet per day, or about 15 gallons per minute. For mass load estimates, this volume could be reduced to reflect only the area of impacted soils, based either on the map of building footprints (Figure 1) or the RI data for distributions of elevated metals in soils. The upper bound volume should probably be further reduced to reflect only a portion of precipitation which infiltrates to groundwater, if that can be constrained from an historical analysis of the development of the site.

The flux estimate is most appropriate to the conceptual model where groundwater currently migrates from the perched system down through the eastern part of the site. The volume estimate is much more general but may be useful to constrain the amount of historical mass loads of metals mobilized from the smelter site.

References

Knight Piésold, 2004, "Field Sampling Report, Round 1, Phase 1, Vasquez Boulevard and Interstate 70 (VBI70), Operable Unit 3 (OU3), Denver, Colorado," March.

U.S. Environmental Protection Agency (EPA), 2003, "Vasquez Boulevard and Interstate 70 (VBI70), Operable Unit 3 (OU3), Denver, Colorado, Final Quality Assurance Project Plan and Sampling and Analysis Plan to Support Human and Ecological Risk Assessment and Remedial Investigation," December.

TRC, Environmental Consultants, Inc. (TRC), 1988. Remedial Investigation Report, Globe Plant Site, Denver, Colorado. September.

Tables

Table 1
Monitoring Well Field Sampling Summary, May - July, 2004

Field Location	Sample Type	Sample Identification	Date Time	Depth (ft bgs)	Elevation (ft amsl)	Total	Dissolved	Comments
MW-30	PE-WATER	MW-30-070104	7/1/04 12:05 PM	NA	NA	X		PE Std 7-B 12-16-03
MW-31	ERB	MW-31-070104	7/1/04 10:05 AM	NA	NA	X		ERB Pump tube & pH/Cond probes
	ERB	MW-31-072804	7/28/04 9:35 AM	NA	NA	X		ERB Pump tube & pH/Cond probes
MW-32	GROUNDWATER	MW-32-070104	7/1/04 10:40 AM	6.07	5201.50	X	X	
	GROUNDWATER	MW-32-072804	7/28/04 10:00 AM	3.92	5203.65	X	X	
MW-33	GROUNDWATER	MW-33-050304	5/4/04 3:30 PM	16.08	5182.59	X	X	
	GROUNDWATER	MW-33-052104	5/21/04 9:30 AM	15.58	5183.09	X	X	
	GROUNDWATER	MW-33-070104	7/1/04 8:50 AM	15.62	5183.05	X	X	
	GROUNDWATER	MW-33-072804	7/28/04 8:50 AM	15.67	5183.00	X	X	
MW-34	GROUNDWATER	MW-34-052104	5/21/04 10:25 AM	21.08	5178.69	X	X	
	GROUNDWATER	MW-34-070104	7/1/04 9:55 AM	19.99	5179.78	X	X	
	GROUNDWATER	MW-34-072804	7/28/04 9:15 AM	19.83	5179.94	X	X	
MW-35	GROUNDWATER	MW-35-052404	5/24/04 1:35 PM	11.15	5167.17		X	
	GROUNDWATER	MW-35-072804	7/28/04 10:55 AM	11.18	5167.14		X	
MW-36	GROUNDWATER	MW-36-052104	5/21/04 11:05 AM	8.28	5166.65	X		
	GROUNDWATER	MW-36-052404	5/24/04 1:55 PM	8.90	5166.03		X	
	GROUNDWATER	MW-36-070104	7/1/04 12:15 PM	8.44	5166.49		X	
	GROUNDWATER	MW-36-072804	7/28/04 10:30 AM	8.52	5166.41		X	

NOTES:

GROUNDWATER	Groundwater Sample
PE-WATER	Performance Evaluation Water Sample
ERB	Equipment Rinseate Blank Sample
Dissolved	Field Filtered Groundwater Sample - Dissolved Metals Analysis
Total	Unfiltered Groundwater Sample - Total Metals Analysis
Depth (ft bgs)	Depth to groundwater before sampling - feet below ground surface.
Elevation (ft amsl)	Groundwater elevation - feet above mean sea level.
NA	Not applicable.

Table 2: May - July, 2004 Data Summary Report

Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-30				
WATER	MW-30-070104	Aluminum, Total	ND	ug/L
		Antimony, Total	130	ug/L
		Arsenic, Total	40	ug/L
		Barium, Total	630	ug/L
		Beryllium, Total	23	ug/L
		Cadmium, Total	24	ug/L
		Calcium, Total	ND	ug/L
		Chromium, Total	ND	ug/L
		Cobalt, Total	180	ug/L
		Copper, Total	ND	ug/L
		Iron, Total	320	ug/L
		Lead, Total	18	ug/L
		Magnesium, Total	13000	ug/L
		Manganese, Total	86	ug/L
		Mercury, Total	ND	ug/L
		Nickel, Total	ND	ug/L
		Potassium, Total	17000	ug/L
		Selenium, Total	75	ug/L
		Silver, Total	36	ug/L
		Sodium, Total	ND	ug/L
		Thallium, Total	29	ug/L
		Vanadium, Total	ND	ug/L
		Zinc, Total	170	ug/L

Depth to Water (ft bgs): 0 ***Groundwater Elev. (ft amsl):*** 0.00

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-31					
	WATER	MW-31-070104	Aluminum, Total	ND	ug/L
			Antimony, Total	ND	ug/L
			Arsenic, Total	ND	ug/L
			Barium, Total	ND	ug/L
			Beryllium, Total	ND	ug/L
			Cadmium, Total	ND	ug/L
			Calcium, Total	290	ug/L
			Chromium, Total	ND	ug/L
			Cobalt, Total	ND	ug/L
			Copper, Total	ND	ug/L
			Iron, Total	ND	ug/L
			Lead, Total	ND	ug/L
			Magnesium, Total	ND	ug/L
			Manganese, Total	ND	ug/L
			Mercury, Total	ND	ug/L
			Nickel, Total	ND	ug/L
			Potassium, Total	ND	ug/L
			Selenium, Total	ND	ug/L
			Silver, Total	ND	ug/L
			Sodium, Total	ND	ug/L
			Thallium, Total	ND	ug/L
			Vanadium, Total	ND	ug/L
			Zinc, Total	ND	ug/L

Depth to Water (ft bgs): 0 ***Groundwater Elev. (ft amsl):*** 0.00

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-31					
	WATER	MW-31-072804	Aluminum, Total	ND	ug/L
			Antimony, Total	ND	ug/L
			Arsenic, Total	ND	ug/L
			Barium, Total	ND	ug/L
			Beryllium, Total	ND	ug/L
			Cadmium, Total	ND	ug/L
			Calcium, Total	ND	ug/L
			Chromium, Total	ND	ug/L
			Cobalt, Total	ND	ug/L
			Copper, Total	ND	ug/L
			Iron, Total	ND	ug/L
			Lead, Total	ND	ug/L
			Magnesium, Total	ND	ug/L
			Manganese, Total	ND	ug/L
			Mercury, Total	ND	ug/L
			Nickel, Total	ND	ug/L
			Potassium, Total	ND	ug/L
			Selenium, Total	ND	ug/L
			Silver, Total	ND	ug/L
			Sodium, Total	ND	ug/L
			Thallium, Total	ND	ug/L
			Vanadium, Total	ND	ug/L
			Zinc, Total	ND	ug/L

Depth to Water (ft bgs): 0 ***Groundwater Elev. (ft amsl):*** 0.00

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-32					
	GW	MW-32-070104	Aluminum, Dissolved	ND	ug/L
			Aluminum, Total	440	ug/L
			Antimony, Dissolved	ND	ug/L
			Antimony, Total	ND	ug/L
			Arsenic, Dissolved	1.7	ug/L
			Arsenic, Total	2.3	ug/L
			Barium, Dissolved	55	ug/L
			Barium, Total	48	ug/L
			Beryllium, Dissolved	ND	ug/L
			Beryllium, Total	ND	ug/L
			Cadmium, Dissolved	ND	ug/L
			Cadmium, Total	ND	ug/L
			Calcium, Dissolved	190000	ug/L
			Calcium, Total	230000	ug/L
			Chromium, Dissolved	ND	ug/L
			Chromium, Total	ND	ug/L
			Cobalt, Dissolved	11	ug/L
			Cobalt, Total	ND	ug/L
			Copper, Dissolved	16	ug/L
			Copper, Total	17	ug/L
			Iron, Dissolved	ND	ug/L
			Iron, Total	320	ug/L
			Lead, Dissolved	ND	ug/L
			Lead, Total	ND	ug/L
			Magnesium, Dissolved	24000	ug/L
			Magnesium, Total	29000	ug/L
			Manganese, Dissolved	71	ug/L
			Manganese, Total	79	ug/L
			Mercury, Dissolved	ND	ug/L
			Mercury, Total	ND	ug/L
			Nickel, Dissolved	ND	ug/L
			Nickel, Total	ND	ug/L
			Potassium, Dissolved	ND	ug/L
			Potassium, Total	ND	ug/L
			Selenium, Dissolved	ND	ug/L
			Selenium, Total	ND	ug/L
			Silver, Dissolved	ND	ug/L
			Silver, Total	ND	ug/L
			Sodium, Dissolved	590000	ug/L
			Sodium, Total	640000	ug/L
			Thallium, Dissolved	ND	ug/L
			Thallium, Total	ND	ug/L
			Vanadium, Dissolved	ND	ug/L
			Vanadium, Total	ND	ug/L
			Zinc, Dissolved	ND	ug/L
			Zinc, Total	ND	ug/L
			Field Conductivity	3460	uS/cm
			Field pH	6.68	No Units
			Field Temperature	19.6	°C

Depth to Water (ft bgs): 6.07 ***Groundwater Elev. (ft amsl):*** 5201.50

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-32					
	GW	MW-32-072804	Aluminum, Dissolved	ND	ug/L
			Aluminum, Total	170	ug/L
			Antimony, Dissolved	ND	ug/L
			Antimony, Total	ND	ug/L
			Arsenic, Dissolved	2.9	ug/L
			Arsenic, Total	2.7	ug/L
			Barium, Dissolved	46	ug/L
			Barium, Total	44	ug/L
			Beryllium, Dissolved	ND	ug/L
			Beryllium, Total	ND	ug/L
			Cadmium, Dissolved	ND	ug/L
			Cadmium, Total	13	ug/L
			Calcium, Dissolved	140000	ug/L
			Calcium, Total	140000	ug/L
			Chromium, Dissolved	ND	ug/L
			Chromium, Total	ND	ug/L
			Cobalt, Dissolved	20	ug/L
			Cobalt, Total	19	ug/L
			Copper, Dissolved	ND	ug/L
			Copper, Total	ND	ug/L
			Iron, Dissolved	3000	ug/L
			Iron, Total	3000	ug/L
			Lead, Dissolved	ND	ug/L
			Lead, Total	ND	ug/L
			Magnesium, Dissolved	18000	ug/L
			Magnesium, Total	18000	ug/L
			Manganese, Dissolved	610	ug/L
			Manganese, Total	650	ug/L
			Mercury, Dissolved	ND	ug/L
			Mercury, Total	ND	ug/L
			Nickel, Dissolved	ND	ug/L
			Nickel, Total	ND	ug/L
			Potassium, Dissolved	ND	ug/L
			Potassium, Total	ND	ug/L
			Selenium, Dissolved	ND	ug/L
			Selenium, Total	ND	ug/L
			Silver, Dissolved	ND	ug/L
			Silver, Total	ND	ug/L
			Sodium, Dissolved	440000	ug/L
			Sodium, Total	440000	ug/L
			Thallium, Dissolved	ND	ug/L
			Thallium, Total	ND	ug/L
			Vanadium, Dissolved	ND	ug/L
			Vanadium, Total	ND	ug/L
			Zinc, Dissolved	ND	ug/L
			Zinc, Total	ND	ug/L
			Field Conductivity	2420	uS/cm
			Field Ph	6.66	No Units
			Field Temperature	20.5	°C

Depth to Water (ft bgs): 3.92 ***Groundwater Elev. (ft amsl):*** 5203.65

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-33					
	GW	MW-33-050304	Aluminum, Dissolved	ND	ug/L
			Aluminum, Total	26000	ug/L
			Antimony, Dissolved	ND	ug/L
			Antimony, Total	ND	ug/L
			Arsenic, Dissolved	2.0	ug/L
			Arsenic, Total	7.1	ug/L
			Barium, Dissolved	24	ug/L
			Barium, Total	220	ug/L
			Beryllium, Dissolved	ND	ug/L
			Beryllium, Total	1.6	ug/L
			Cadmium, Dissolved	69	ug/L
			Cadmium, Total	87	ug/L
			Calcium, Dissolved	74000	ug/L
			Calcium, Total	77000	ug/L
			Chromium, Dissolved	ND	ug/L
			Chromium, Total	26	ug/L
			Cobalt, Dissolved	18	ug/L
			Cobalt, Total	64	ug/L
			Copper, Dissolved	ND	ug/L
			Copper, Total	96	ug/L
			Iron, Dissolved	ND	ug/L
			Iron, Total	28000	ug/L
			Lead, Dissolved	ND	ug/L
			Lead, Total	26	ug/L
			Magnesium, Dissolved	7400	ug/L
			Magnesium, Total	11000	ug/L
			Manganese, Dissolved	1200	ug/L
			Manganese, Total	1300	ug/L
			Mercury, Dissolved	ND	ug/L
			Mercury, Total	ND	ug/L
			Nickel, Dissolved	ND	ug/L
			Nickel, Total	46	ug/L
			pH	6.5	No Units
			Potassium, Dissolved	ND	ug/L
			Potassium, Total	6500	ug/L
			Selenium, Dissolved	ND	ug/L
			Selenium, Total	ND	ug/L
			Silver, Dissolved	ND	ug/L
			Silver, Total	ND	ug/L
			Sodium, Dissolved	120000	ug/L
			Sodium, Total	100000	ug/L
			Specific Conductance	780	umhos/cm
			Thallium, Dissolved	ND	ug/L
			Thallium, Total	ND	ug/L
			Vanadium, Dissolved	ND	ug/L
			Vanadium, Total	38	ug/L
			Zinc, Dissolved	190	ug/L
			Zinc, Total	940	ug/L

Depth to Water (ft bgs): 16.08 ***Groundwater Elev. (ft amsl):*** 5182.59

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-33					
	GW	MW-33-052104	Aluminum, Dissolved	ND	ug/L
			Aluminum, Total	580	ug/L
			Antimony, Dissolved	ND	ug/L
			Antimony, Total	ND	ug/L
			Arsenic, Dissolved	2.0	ug/L
			Arsenic, Total	1.9	ug/L
			Barium, Dissolved	23	ug/L
			Barium, Total	29	ug/L
			Beryllium, Dissolved	ND	ug/L
			Beryllium, Total	ND	ug/L
			Cadmium, Dissolved	40	ug/L
			Cadmium, Total	27	ug/L
			Calcium, Dissolved	66000	ug/L
			Calcium, Total	66000	ug/L
			Chromium, Dissolved	ND	ug/L
			Chromium, Total	ND	ug/L
			Cobalt, Dissolved	ND	ug/L
			Cobalt, Total	ND	ug/L
			Copper, Dissolved	ND	ug/L
			Copper, Total	ND	ug/L
			Iron, Dissolved	ND	ug/L
			Iron, Total	560	ug/L
			Lead, Dissolved	ND	ug/L
			Lead, Total	ND	ug/L
			Magnesium, Dissolved	6600	ug/L
			Magnesium, Total	6700	ug/L
			Manganese, Dissolved	450	ug/L
			Manganese, Total	51	ug/L
			Mercury, Dissolved	ND	ug/L
			Mercury, Total	ND	ug/L
			Nickel, Dissolved	ND	ug/L
			Nickel, Total	ND	ug/L
			pH	6.5	No Units
			Potassium, Dissolved	ND	ug/L
			Potassium, Total	ND	ug/L
			Selenium, Dissolved	ND	ug/L
			Selenium, Total	ND	ug/L
			Silver, Dissolved	ND	ug/L
			Silver, Total	ND	ug/L
			Sodium, Dissolved	88000	ug/L
			Sodium, Total	82000	ug/L
			Specific Conductance	800	umhos/cm
			Thallium, Dissolved	ND	ug/L
			Thallium, Total	ND	ug/L
			Total Dissolved Solids	160	mg/L
			Vanadium, Dissolved	ND	ug/L
			Vanadium, Total	ND	ug/L
			Zinc, Dissolved	180	ug/L
			Zinc, Total	190	ug/L
			Field Conductivity	690	uS/cm
			Field pH	6.22	No Units
			Field Temperature	17.5	°C

Depth to Water (ft bgs): 15.58 ***Groundwater Elev. (ft amsl):*** 5183.09

Table 2: May - July, 2004 Data Summary Report

Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-33				
GW	MW-33-070104	Aluminum, Dissolved	ND	ug/L
		Aluminum, Total	420	ug/L
		Antimony, Dissolved	ND	ug/L
		Antimony, Total	ND	ug/L
		Arsenic, Dissolved	2.8	ug/L
		Arsenic, Total	3.1	ug/L
		Barium, Dissolved	26	ug/L
		Barium, Total	30	ug/L
		Beryllium, Dissolved	ND	ug/L
		Beryllium, Total	ND	ug/L
		Cadmium, Dissolved	26	ug/L
		Cadmium, Total	27	ug/L
		Calcium, Dissolved	73000	ug/L
		Calcium, Total	75000	ug/L
		Chromium, Dissolved	ND	ug/L
		Chromium, Total	ND	ug/L
		Cobalt, Dissolved	ND	ug/L
		Cobalt, Total	ND	ug/L
		Copper, Dissolved	ND	ug/L
		Copper, Total	ND	ug/L
		Iron, Dissolved	ND	ug/L
		Iron, Total	330	ug/L
		Lead, Dissolved	ND	ug/L
		Lead, Total	ND	ug/L
		Magnesium, Dissolved	7000	ug/L
		Magnesium, Total	7300	ug/L
		Manganese, Dissolved	15	ug/L
		Manganese, Total	32	ug/L
		Mercury, Dissolved	ND	ug/L
		Mercury, Total	ND	ug/L
		Nickel, Dissolved	ND	ug/L
		Nickel, Total	ND	ug/L
		pH	6.6	No Units
		Potassium, Dissolved	ND	ug/L
		Potassium, Total	ND	ug/L
		Selenium, Dissolved	ND	ug/L
		Selenium, Total	ND	ug/L
		Silver, Dissolved	ND	ug/L
		Silver, Total	ND	ug/L
		Sodium, Dissolved	92000	ug/L
		Sodium, Total	93000	ug/L
		Specific Conductance	840	umhos/cm
		Thallium, Dissolved	ND	ug/L
		Thallium, Total	ND	ug/L
		Total Dissolved Solids	500	mg/L
		Vanadium, Dissolved	ND	ug/L
		Vanadium, Total	ND	ug/L
		Zinc, Dissolved	200	ug/L
		Zinc, Total	220	ug/L
		Field Conductivity	766	uS/cm
		Field pH	6.28	No Units
		Field Temperature	19.3	°C

Depth to Water (ft bgs): 15.62 ***Groundwater Elev. (ft amsl):*** 5183.05

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-33					
	GW	MW-33-072804	Aluminum, Dissolved	ND	ug/L
			Aluminum, Total	110	ug/L
			Antimony, Dissolved	ND	ug/L
			Antimony, Total	ND	ug/L
			Arsenic, Dissolved	2.2	ug/L
			Arsenic, Total	2.2	ug/L
			Barium, Dissolved	35	ug/L
			Barium, Total	34	ug/L
			Beryllium, Dissolved	ND	ug/L
			Beryllium, Total	ND	ug/L
			Cadmium, Dissolved	34	ug/L
			Cadmium, Total	33	ug/L
			Calcium, Dissolved	100000	ug/L
			Calcium, Total	100000	ug/L
			Chromium, Dissolved	ND	ug/L
			Chromium, Total	ND	ug/L
			Cobalt, Dissolved	ND	ug/L
			Cobalt, Total	ND	ug/L
			Copper, Dissolved	ND	ug/L
			Copper, Total	ND	ug/L
			Iron, Dissolved	ND	ug/L
			Iron, Total	170	ug/L
			Lead, Dissolved	ND	ug/L
			Lead, Total	ND	ug/L
			Magnesium, Dissolved	10000	ug/L
			Magnesium, Total	9800	ug/L
			Manganese, Dissolved	ND	ug/L
			Manganese, Total	23	ug/L
			Mercury, Dissolved	ND	ug/L
			Mercury, Total	ND	ug/L
			Nickel, Dissolved	ND	ug/L
			Nickel, Total	ND	ug/L
			pH	6.6	No Units
			Potassium, Dissolved	ND	ug/L
			Potassium, Total	ND	ug/L
			Selenium, Dissolved	ND	ug/L
			Selenium, Total	ND	ug/L
			Silver, Dissolved	ND	ug/L
			Silver, Total	ND	ug/L
			Sodium, Dissolved	120000	ug/L
			Sodium, Total	120000	ug/L
			Specific Conductance	1000	umhos/cm
			Thallium, Dissolved	ND	ug/L
			Thallium, Total	ND	ug/L
			Total Dissolved Solids	630	mg/L
			Vanadium, Dissolved	ND	ug/L
			Vanadium, Total	ND	ug/L
			Zinc, Dissolved	260	ug/L
			Zinc, Total	250	ug/L
			Field Conductivity	980	uS/cm
			Field Ph	6.30	No Units
			Field Temperature	18.9	°C

Depth to Water (ft bgs): 15.67 ***Groundwater Elev. (ft amsl):*** 5183.00

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-34					
	GW	MW-34-052104	Aluminum, Dissolved	ND	ug/L
			Aluminum, Total	260	ug/L
			Antimony, Dissolved	ND	ug/L
			Antimony, Total	ND	ug/L
			Arsenic, Dissolved	1.0	ug/L
			Arsenic, Total	ND	ug/L
			Barium, Dissolved	62	ug/L
			Barium, Total	65	ug/L
			Beryllium, Dissolved	ND	ug/L
			Beryllium, Total	ND	ug/L
			Cadmium, Dissolved	5.9	ug/L
			Cadmium, Total	7.5	ug/L
			Calcium, Dissolved	630000	ug/L
			Calcium, Total	610000	ug/L
			Chromium, Dissolved	ND	ug/L
			Chromium, Total	ND	ug/L
			Cobalt, Dissolved	ND	ug/L
			Cobalt, Total	ND	ug/L
			Copper, Dissolved	11	ug/L
			Copper, Total	14	ug/L
			Iron, Dissolved	180	ug/L
			Iron, Total	1100	ug/L
			Lead, Dissolved	ND	ug/L
			Lead, Total	ND	ug/L
			Magnesium, Dissolved	57000	ug/L
			Magnesium, Total	54000	ug/L
			Manganese, Dissolved	640	ug/L
			Manganese, Total	840	ug/L
			Mercury, Dissolved	ND	ug/L
			Mercury, Total	ND	ug/L
			Nickel, Dissolved	ND	ug/L
			Nickel, Total	ND	ug/L
			Potassium, Dissolved	12000	ug/L
			Potassium, Total	13000	ug/L
			Selenium, Dissolved	ND	ug/L
			Selenium, Total	ND	ug/L
			Silver, Dissolved	ND	ug/L
			Silver, Total	ND	ug/L
			Sodium, Dissolved	680000	ug/L
			Sodium, Total	670000	ug/L
			Thallium, Dissolved	ND	ug/L
			Thallium, Total	ND	ug/L
			Vanadium, Dissolved	ND	ug/L
			Vanadium, Total	ND	ug/L
			Zinc, Dissolved	45	ug/L
			Zinc, Total	65	ug/L
			Field Conductivity	5002	uS/cm
			Field pH	6.56	No Units
			Field Temperature	17.7	°C

Depth to Water (ft bgs): 21.08 ***Groundwater Elev. (ft amsl):*** 5178.69

Table 2: May - July, 2004 Data Summary Report

Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-34				
GW	MW-34-070104	Aluminum, Dissolved	ND	ug/L
		Aluminum, Total	ND	ug/L
		Antimony, Dissolved	ND	ug/L
		Antimony, Total	ND	ug/L
		Arsenic, Dissolved	1.3	ug/L
		Arsenic, Total	ND	ug/L
		Barium, Dissolved	48	ug/L
		Barium, Total	63	ug/L
		Beryllium, Dissolved	ND	ug/L
		Beryllium, Total	ND	ug/L
		Cadmium, Dissolved	2.1	ug/L
		Cadmium, Total	3.5	ug/L
		Calcium, Dissolved	540000	ug/L
		Calcium, Total	670000	ug/L
		Chromium, Dissolved	ND	ug/L
		Chromium, Total	ND	ug/L
		Cobalt, Dissolved	ND	ug/L
		Cobalt, Total	ND	ug/L
		Copper, Dissolved	ND	ug/L
		Copper, Total	ND	ug/L
		Iron, Dissolved	ND	ug/L
		Iron, Total	160	ug/L
		Lead, Dissolved	ND	ug/L
		Lead, Total	ND	ug/L
		Magnesium, Dissolved	61000	ug/L
		Magnesium, Total	75000	ug/L
		Manganese, Dissolved	98	ug/L
		Manganese, Total	140	ug/L
		Mercury, Dissolved	ND	ug/L
		Mercury, Total	ND	ug/L
		Nickel, Dissolved	ND	ug/L
		Nickel, Total	ND	ug/L
		Potassium, Dissolved	9400	ug/L
		Potassium, Total	11000	ug/L
		Selenium, Dissolved	ND	ug/L
		Selenium, Total	ND	ug/L
		Silver, Dissolved	ND	ug/L
		Silver, Total	ND	ug/L
		Sodium, Dissolved	630000	ug/L
		Sodium, Total	720000	ug/L
		Thallium, Dissolved	ND	ug/L
		Thallium, Total	ND	ug/L
		Vanadium, Dissolved	ND	ug/L
		Vanadium, Total	ND	ug/L
		Zinc, Dissolved	ND	ug/L
		Zinc, Total	76	ug/L
		Field Conductivity	3560	uS/cm
		Field pH	6.91	No Units
		Field Temperature	21.6	°C

Depth to Water (ft bgs): 19.99 ***Groundwater Elev. (ft amsl):*** 5179.78

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-34					
	GW	MW-34-072804	Aluminum, Dissolved	ND	ug/L
			Aluminum, Total	390	ug/L
			Antimony, Dissolved	ND	ug/L
			Antimony, Total	ND	ug/L
			Arsenic, Dissolved	ND	ug/L
			Arsenic, Total	1.3	ug/L
			Barium, Dissolved	36	ug/L
			Barium, Total	36	ug/L
			Beryllium, Dissolved	ND	ug/L
			Beryllium, Total	ND	ug/L
			Cadmium, Dissolved	1.8	ug/L
			Cadmium, Total	17	ug/L
			Calcium, Dissolved	380000	ug/L
			Calcium, Total	300000	ug/L
			Chromium, Dissolved	ND	ug/L
			Chromium, Total	ND	ug/L
			Cobalt, Dissolved	ND	ug/L
			Cobalt, Total	ND	ug/L
			Copper, Dissolved	ND	ug/L
			Copper, Total	ND	ug/L
			Iron, Dissolved	ND	ug/L
			Iron, Total	700	ug/L
			Lead, Dissolved	ND	ug/L
			Lead, Total	ND	ug/L
			Magnesium, Dissolved	42000	ug/L
			Magnesium, Total	36000	ug/L
			Manganese, Dissolved	23	ug/L
			Manganese, Total	45	ug/L
			Mercury, Dissolved	ND	ug/L
			Mercury, Total	ND	ug/L
			Nickel, Dissolved	ND	ug/L
			Nickel, Total	ND	ug/L
			Potassium, Dissolved	7300	ug/L
			Potassium, Total	6600	ug/L
			Selenium, Dissolved	ND	ug/L
			Selenium, Total	ND	ug/L
			Silver, Dissolved	ND	ug/L
			Silver, Total	ND	ug/L
			Sodium, Dissolved	540000	ug/L
			Sodium, Total	470000	ug/L
			Thallium, Dissolved	ND	ug/L
			Thallium, Total	ND	ug/L
			Vanadium, Dissolved	ND	ug/L
			Vanadium, Total	ND	ug/L
			Zinc, Dissolved	ND	ug/L
			Zinc, Total	ND	ug/L
			Field Conductivity	3940	uS/cm
			Field Ph	6.83	No Units
			Field Temperature	17.6	°C

Depth to Water (ft bgs): 19.83 ***Groundwater Elev. (ft amsl):*** 5179.94

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-35					
	GW	MW-35-052404	Aluminum, Dissolved	ND	ug/L
			Antimony, Dissolved	ND	ug/L
			Arsenic, Dissolved	1.0	ug/L
			Barium, Dissolved	76	ug/L
			Beryllium, Dissolved	ND	ug/L
			Cadmium, Dissolved	3.0	ug/L
			Calcium, Dissolved	120000	ug/L
			Chromium, Dissolved	ND	ug/L
			Cobalt, Dissolved	ND	ug/L
			Copper, Dissolved	ND	ug/L
			Iron, Dissolved	ND	ug/L
			Lead, Dissolved	ND	ug/L
			Magnesium, Dissolved	14000	ug/L
			Manganese, Dissolved	11	ug/L
			Mercury, Dissolved	ND	ug/L
			Nickel, Dissolved	ND	ug/L
			Potassium, Dissolved	4100	ug/L
			Selenium, Dissolved	ND	ug/L
			Silver, Dissolved	ND	ug/L
			Sodium, Dissolved	140000	ug/L
			Thallium, Dissolved	ND	ug/L
			Vanadium, Dissolved	ND	ug/L
			Zinc, Dissolved	ND	ug/L
			Field Conductivity	1285	uS/cm
			Field pH	6.90	No Units
			Field Temperature	19.9	°C

Depth to Water (ft bgs): 11.15 ***Groundwater Elev. (ft amsl):*** 5167.17

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-35					
	GW	MW-35-072804	Aluminum, Dissolved	ND	ug/L
			Antimony, Dissolved	ND	ug/L
			Arsenic, Dissolved	1.0	ug/L
			Barium, Dissolved	110	ug/L
			Beryllium, Dissolved	ND	ug/L
			Cadmium, Dissolved	3.6	ug/L
			Calcium, Dissolved	120000	ug/L
			Chromium, Dissolved	ND	ug/L
			Cobalt, Dissolved	ND	ug/L
			Copper, Dissolved	ND	ug/L
			Iron, Dissolved	ND	ug/L
			Lead, Dissolved	ND	ug/L
			Magnesium, Dissolved	14000	ug/L
			Manganese, Dissolved	ND	ug/L
			Nickel, Dissolved	ND	ug/L
			Potassium, Dissolved	4200	ug/L
			Selenium, Dissolved	ND	ug/L
			Silver, Dissolved	ND	ug/L
			Sodium, Dissolved	140000	ug/L
			Thallium, Dissolved	ND	ug/L
			Vanadium, Dissolved	ND	ug/L
			Zinc, Dissolved	23	ug/L
			Field Conductivity	1220	uS/cm
			Field Ph	7.07	No Units
			Field Temperature	23.7	°C

Depth to Water (ft bgs): 11.18 ***Groundwater Elev. (ft amsl):*** 5167.14

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-36					
	GW	MW-36-052104	Aluminum, Total	1300	ug/L
			Antimony, Total	ND	ug/L
			Arsenic, Total	10	ug/L
			Barium, Total	100	ug/L
			Beryllium, Total	ND	ug/L
			Cadmium, Total	41	ug/L
			Calcium, Total	480000	ug/L
			Chromium, Total	ND	ug/L
			Cobalt, Total	ND	ug/L
			Copper, Total	46	ug/L
			Iron, Total	1500	ug/L
			Lead, Total	7.2	ug/L
			Magnesium, Total	60000	ug/L
			Manganese, Total	1600	ug/L
			Mercury, Total	ND	ug/L
			Nickel, Total	ND	ug/L
			Potassium, Total	11000	ug/L
			Selenium, Total	ND	ug/L
			Silver, Total	ND	ug/L
			Sodium, Total	430000	ug/L
			Thallium, Total	ND	ug/L
			Vanadium, Total	ND	ug/L
			Zinc, Total	200	ug/L
			Field Conductivity	3670	uS/cm
			Field pH	6.82	No Units
			Field Temperature	18.5	°C

Depth to Water (ft bgs): 8.28 ***Groundwater Elev. (ft amsl):*** 5166.65

Table 2: May - July, 2004 Data Summary Report

	Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-36					
	GW	MW-36-052404	Aluminum, Dissolved	ND	ug/L
			Antimony, Dissolved	ND	ug/L
			Arsenic, Dissolved	6.0	ug/L
			Barium, Dissolved	110	ug/L
			Beryllium, Dissolved	ND	ug/L
			Cadmium, Dissolved	47	ug/L
			Calcium, Dissolved	430000	ug/L
			Chromium, Dissolved	ND	ug/L
			Cobalt, Dissolved	11	ug/L
			Copper, Dissolved	27	ug/L
			Iron, Dissolved	150	ug/L
			Lead, Dissolved	ND	ug/L
			Magnesium, Dissolved	50000	ug/L
			Manganese, Dissolved	3800	ug/L
			Mercury, Dissolved	ND	ug/L
			Nickel, Dissolved	ND	ug/L
			Potassium, Dissolved	8700	ug/L
			Selenium, Dissolved	ND	ug/L
			Silver, Dissolved	ND	ug/L
			Sodium, Dissolved	380000	ug/L
			Thallium, Dissolved	ND	ug/L
			Vanadium, Dissolved	ND	ug/L
			Zinc, Dissolved	98	ug/L

Depth to Water (ft bgs): 8.9 ***Groundwater Elev. (ft amsl):*** 5166.03

Table 2: May - July, 2004 Data Summary Report

Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-36				
GW	MW-36-070104	Aluminum, Dissolved	ND	ug/L
		Antimony, Dissolved	ND	ug/L
		Arsenic, Dissolved	9.2	ug/L
		Barium, Dissolved	100	ug/L
		Beryllium, Dissolved	ND	ug/L
		Cadmium, Dissolved	26	ug/L
		Calcium, Dissolved	410000	ug/L
		Chromium, Dissolved	ND	ug/L
		Cobalt, Dissolved	ND	ug/L
		Copper, Dissolved	22	ug/L
		Iron, Dissolved	ND	ug/L
		Lead, Dissolved	ND	ug/L
		Magnesium, Dissolved	46000	ug/L
		Manganese, Dissolved	1900	ug/L
		Mercury, Dissolved	ND	ug/L
		Nickel, Dissolved	ND	ug/L
		Potassium, Dissolved	8000	ug/L
		Selenium, Dissolved	ND	ug/L
		Silver, Dissolved	ND	ug/L
		Sodium, Dissolved	380000	ug/L
		Thallium, Dissolved	ND	ug/L
		Vanadium, Dissolved	ND	ug/L
		Zinc, Dissolved	140	ug/L
		Field Conductivity	3500	uS/cm
		Field pH	6.80	No Units
		Field Temperature	22.0	°C

Depth to Water (ft bgs): 8.44 ***Groundwater Elev. (ft amsl):*** 5166.49

Table 2: May - July, 2004 Data Summary Report

Matrix	*Client ID*	*Component*	*Result*	*Units*
MW-36				
GW	MW-36-072804	Aluminum, Dissolved	ND	ug/L
		Antimony, Dissolved	ND	ug/L
		Arsenic, Dissolved	6.1	ug/L
		Barium, Dissolved	86	ug/L
		Beryllium, Dissolved	ND	ug/L
		Cadmium, Dissolved	53	ug/L
		Calcium, Dissolved	450000	ug/L
		Chromium, Dissolved	ND	ug/L
		Cobalt, Dissolved	ND	ug/L
		Copper, Dissolved	22	ug/L
		Iron, Dissolved	ND	ug/L
		Lead, Dissolved	ND	ug/L
		Magnesium, Dissolved	51000	ug/L
		Manganese, Dissolved	540	ug/L
		Mercury, Dissolved	ND	ug/L
		Nickel, Dissolved	ND	ug/L
		Potassium, Dissolved	8200	ug/L
		Selenium, Dissolved	ND	ug/L
		Silver, Dissolved	ND	ug/L
		Sodium, Dissolved	420000	ug/L
		Thallium, Dissolved	ND	ug/L
		Vanadium, Dissolved	ND	ug/L
		Zinc, Dissolved	110	ug/L
		Field Conductivity	3390	uS/cm
		Field Ph	6.88	No Units
		Field Temperature	25.7	°C

Depth to Water (ft bgs): 8.52 ***Groundwater Elev. (ft amsl):*** 5166.41

Table 3: May-July, 2004 Monitoring Wells MCL Summary Report

SWL (ft amsl)	*Sample ID*	*Parameter*	*Result*	*Primary MCL*	*Secondary MCL*	*Units*
MW-32						
5201.50	MW-32-070104	Aluminum, Total	440		200	ug/L
		Iron, Total	320		300	ug/L
		Manganese, Dissolved	71		50	ug/L
		Manganese, Total	79		50	ug/L
5203.65	MW-32-072804	Cadmium, Total	13	5		ug/L
		Iron, Dissolved	3000		300	ug/L
		Iron, Total	3000		300	ug/L
		Manganese, Dissolved	610		50	ug/L
		Manganese, Total	650		50	ug/L
MW-33						
5182.59	MW-33-050304	Aluminum, Total	26000		200	ug/L
		Cadmium, Dissolved	69	5		ug/L
		Cadmium, Total	87	5		ug/L
		Iron, Total	28000		300	ug/L
		Lead, Total	26	15		ug/L
		Manganese, Dissolved	1200		50	ug/L
		Manganese, Total	1300		50	ug/L
5183.09	MW-33-052104	Aluminum, Total	580		200	ug/L
		Cadmium, Dissolved	40	5		ug/L
		Cadmium, Total	27	5		ug/L
		Iron, Total	560		300	ug/L
		Manganese, Dissolved	450		50	ug/L
		Manganese, Total	51		50	ug/L
5183.05	MW-33-070104	Aluminum, Total	420		200	ug/L
		Cadmium, Dissolved	26	5		ug/L
		Cadmium, Total	27	5		ug/L
		Iron, Total	330		300	ug/L
5183.00	MW-33-072804	Cadmium, Dissolved	34	5		ug/L
		Cadmium, Total	33	5		ug/L
MW-34						

Table 3: May-July, 2004 Monitoring Wells MCL Summary Report

SWL (ft amsl)	*Sample ID*	*Parameter*	*Result*	*Primary MCL*	*Secondary MCL*	*Units*
MW-34						
5178.69	MW-34-052104	Aluminum, Total	260		200	ug/L
		Cadmium, Dissolved	5.9	5		ug/L
		Cadmium, Total	7.5	5		ug/L
		Iron, Total	1100		300	ug/L
		Manganese, Dissolved	640		50	ug/L
		Manganese, Total	840		50	ug/L
5179.78	MW-34-070104	Manganese, Dissolved	98		50	ug/L
		Manganese, Total	140		50	ug/L
5179.94	MW-34-072804	Aluminum, Total	390		200	ug/L
		Cadmium, Total	17	5		ug/L
		Iron, Total	700		300	ug/L
MW-36						
5166.65	MW-36-052104	Aluminum, Total	1300		200	ug/L
		Cadmium, Total	41	5		ug/L
		Iron, Total	1500		300	ug/L
		Manganese, Total	1600		50	ug/L
5166.03	MW-36-052404	Cadmium, Dissolved	47	5		ug/L
		Manganese, Dissolved	3800		50	ug/L
5166.49	MW-36-070104	Cadmium, Dissolved	26	5		ug/L
		Manganese, Dissolved	1900		50	ug/L
5166.41	MW-36-072804	Cadmium, Dissolved	53	5		ug/L
		Manganese, Dissolved	540		50	ug/L

Figures

Color Photo(s)

The following pages contain color that does not appear in the scanned images.

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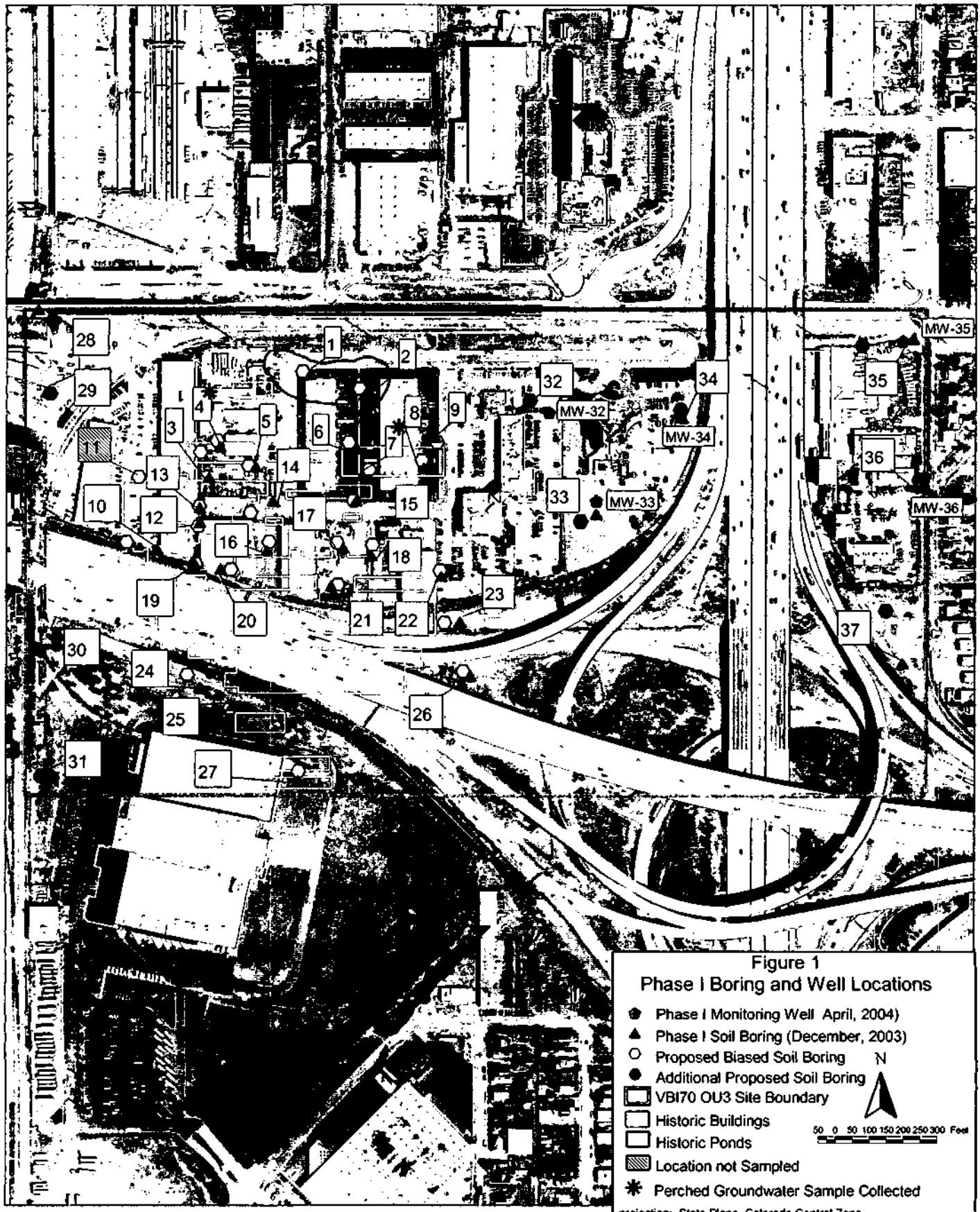


Figure 1
Phase I Boring and Well Locations

- Phase I Monitoring Well April, 2004)
- Phase I Soil Boring (December, 2003)
- Proposed Biased Soil Boring
- Additional Proposed Soil Boring
- VBI70 OU3 Site Boundary
- Historic Buildings
- Historic Ponds
- Location not Sampled
- Perched Groundwater Sample Collected

N

50 0 50 100 150 200 250 300 Feet

projection: State Plane, Colorado Central Zone
horizontal datum: NAD83/92 Adjusted to the HARN
vertical datum: NAVD88

Appendix A

Underground Utilities Clearances

FACILITY LOCATION SKETCH

UTILIQUEST
Utility Services Solutions

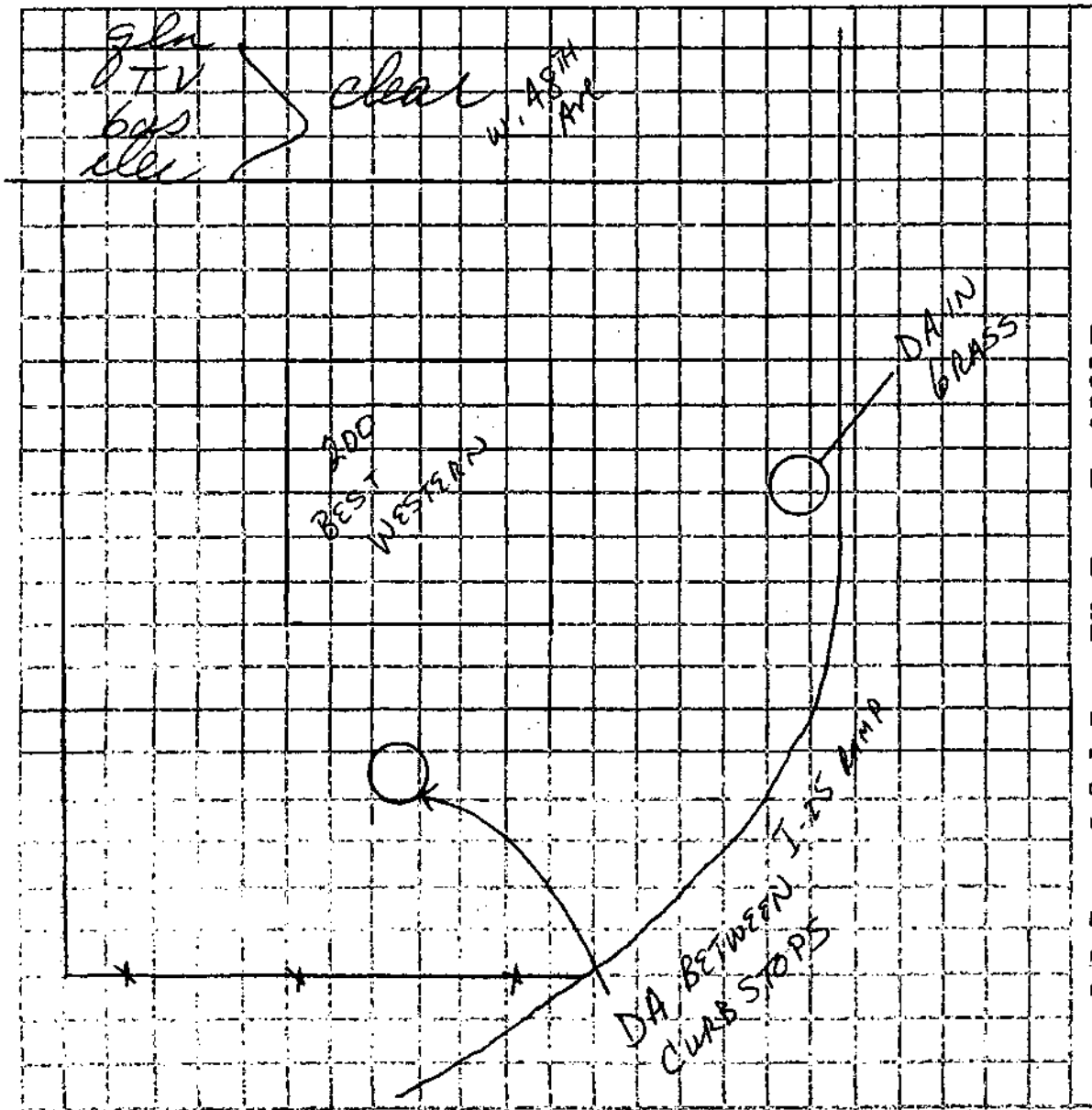
TICKET # 161032 Area#: 12

DATE: 4-6-04

ADDRESS: 200 W. 48TH Ave

EXCAVATOR: Knight Piesold / premarked areas

How Marked: ☐ Paint ☐ Flags ☐ Nylon Whiskers Print# 21 42-164 Time Arrived _____ Time Completed _____



N

LOCATOR INDICATE NORTH

☐ **DIG ALERT**
Major facility in or near dig area. Please hand dig and expose all facilities or call Utiliquest for assistance!

☐ **Watch & Protect/ Standby Required**

☐ **Copy left at site**

Sketch left at: _____

EXCAVATOR NOTIFIED
Name _____
Date: / / Time: ___ AM PM
Log# _____

FACILITY OWNER NOTIFIED
Name _____
Date: / / Time: ___ AM PM

THIS SKETCH IS APPROXIMATE: 18 INCHES HORIZONTALLY FROM EXTERIOR SIDE OF THE FACILITY IS CONSIDERED A CORRECT LOCATION

COMMENTS _____

PRINT LOCATOR'S NAME _____ DATE 4-6-04

Signature of person on job site _____

CONTRACTOR

EXTENDED JOB AGREEMENT
Our company and I agree that this original locate ticket is an extended job and that locates will be done on a day-to-day basis. No excavating will take place until signed paperwork is received by our Company with the dig area defined.

Excavators Signature _____

FACILITY LOCATION SKETCH

UTILIQUEST
Utility Services Solutions

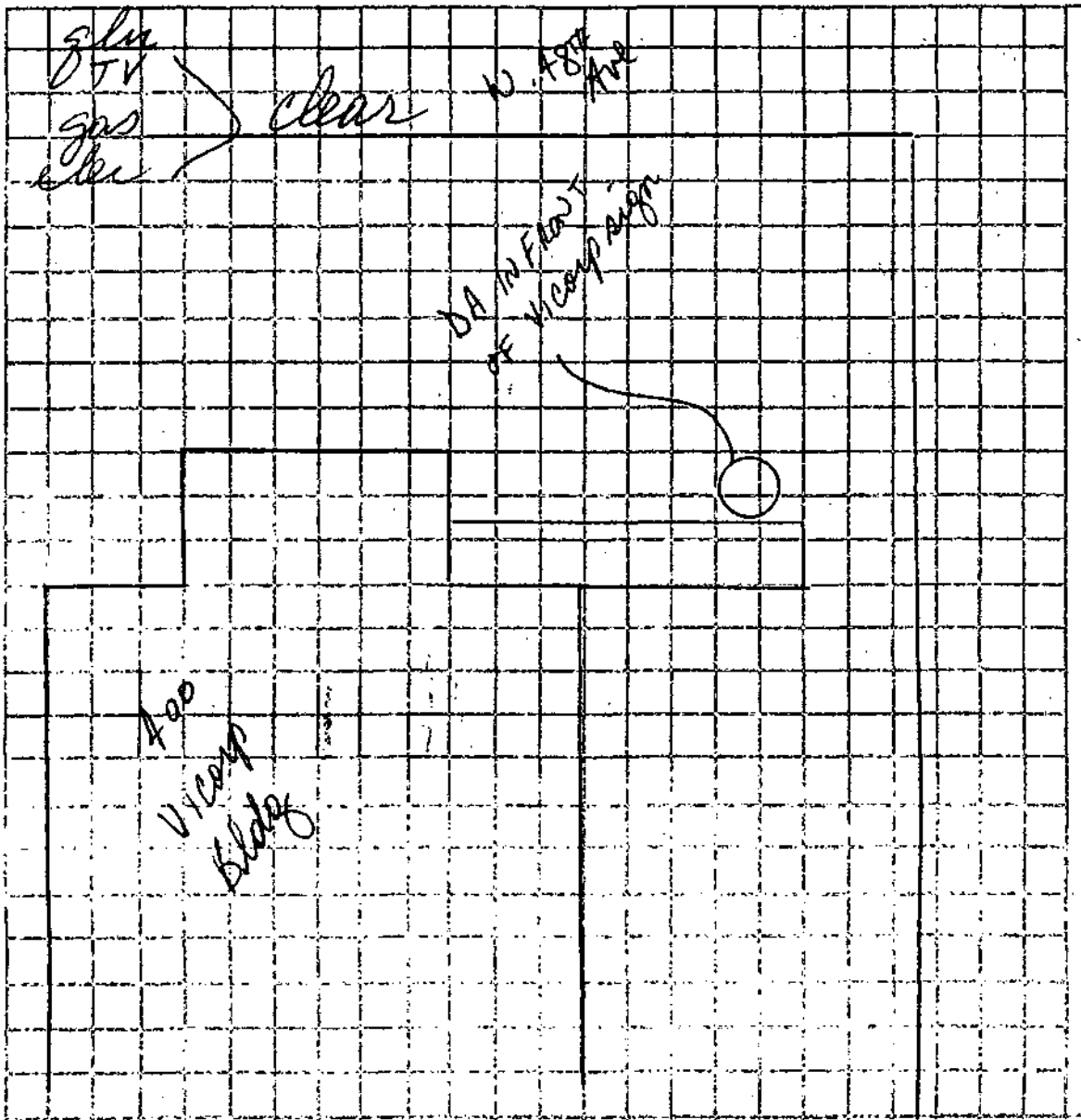
TICKET # 161042 Area#: 12

DATE: 4-6-04

ADDRESS: 400 W. 48TH Ave

EXCAVATOR: Knight Piesold / premarked area

How Marked: ☐ Paint ☐ Flags ☐ Nylon Whiskers Print# 2142-164 Time Arrived _____ Time Completed _____



N

LOCATOR INDICATE NORTH

☐ **DIG ALERT**
Major facility in or near dig area. Please hand dig and expose all facilities or call Utiliquest for assistance!

☐ **Watch & Protect/ Standby Required**

☐ **Copy left at site**

Sketch left at: _____

EXCAVATOR NOTIFIED
Name _____
Date: / / Time: : AM PM
Log# _____

FACILITY OWNER NOTIFIED
Name _____
Date: / / Time: : AM PM

THIS SKETCH IS APPROXIMATE: 18 INCHES HORIZONTALLY FROM EXTERIOR SIDE OF THE FACILITY IS CONSIDERED A CORRECT LOCATION

COMMENTS _____

PRINT LOCATOR'S NAME _____ DATE 4-6-04

Signature of person on job site _____

CONTRACTOR

EXTENDED JOB AGREEMENT
Our company and I agree that this original locate ticket is an extended job and that locates will be done on a day-to-day basis. No excavating will take place until signed paperwork is received by our Company with the dig area defined.

Excavators Signature _____

FACILITY LOCATION SKETCH

UTILIQUEST
Utility Services Solutions

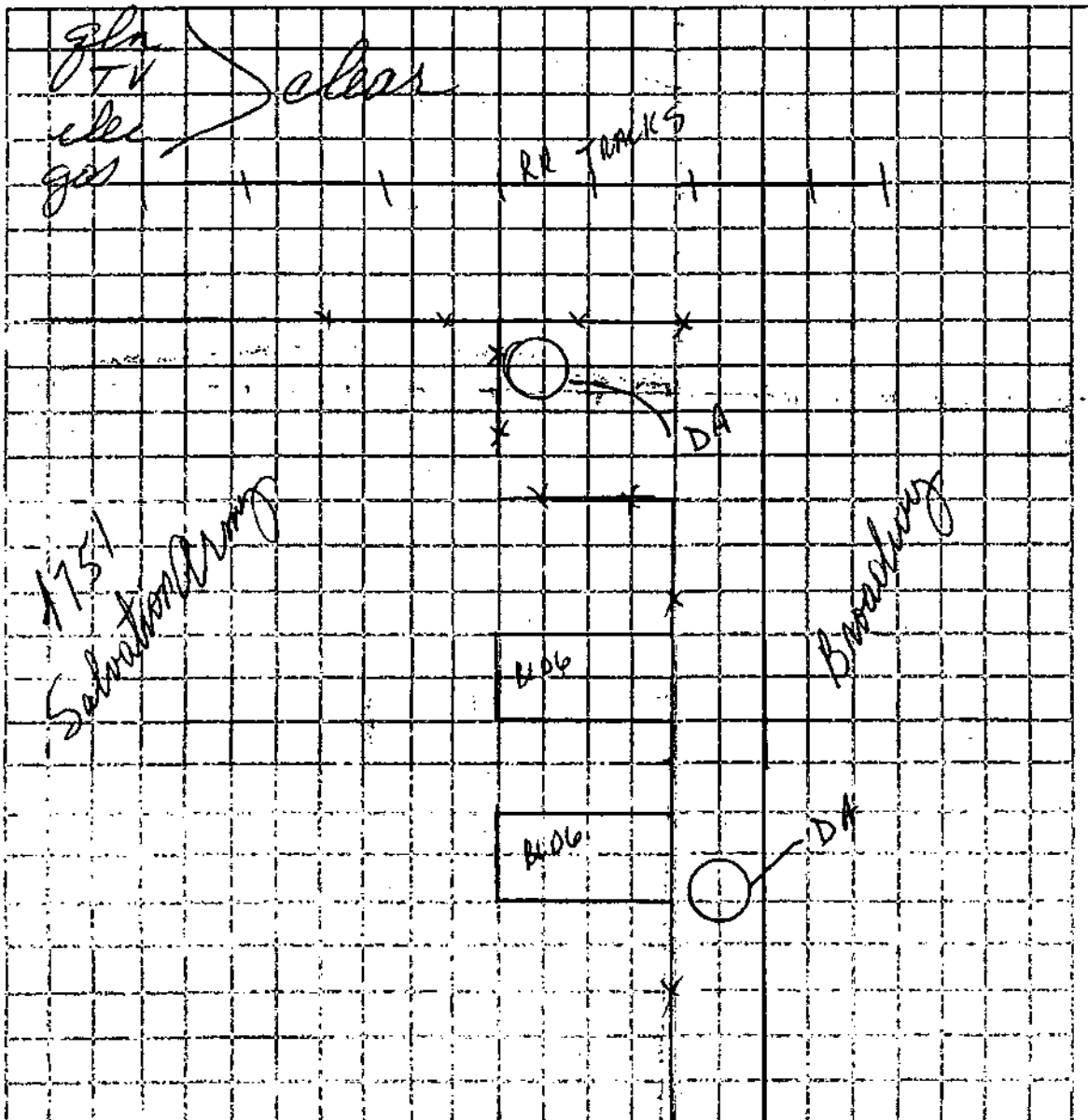
TICKET # 161061 Area#: 14

DATE: 4-6-04

ADDRESS: 4751 Broadway

EXCAVATOR: Knight Piesold

How Marked: ☐ Paint ☐ Flags ☐ Nylon Whiskers Print# 2142-164 Time Arrived _____ Time Completed _____



N

LOCATOR INDICATE NORTH

☐ **DIG ALERT**
Major facility in or near dig area. Please hand dig and expose all facilities or call Utiliquest for assistance!

☐ **Watch & Protect/ Standby Required**

☐ **Copy left at site**

Sketch left at: _____

EXCAVATOR NOTIFIED
Name _____
Date: / / Time: ____ AM PM
Log# _____

FACILITY OWNER NOTIFIED
Name _____
Date: / / Time: ____ AM PM

THIS SKETCH IS APPROXIMATE: 18 INCHES HORIZONTALLY FROM EXTERIOR SIDE OF THE FACILITY IS CONSIDERED A CORRECT LOCATION.

COMMENTS _____

PRINT LOCATOR'S NAME G Colt DATE 4-6-04

Signature of person on job site _____

CONTRACTOR

EXTENDED JOB AGREEMENT
Our company and I agree that this original locate ticket is an extended job and that locates will be done on a day-to-day basis. No excavating will take place until signed paperwork is received by our Company with the dig area defined.

Excavators Signature _____

Diversified Underground, Inc. Phone (303) 636-9999. Fax (303) 671-8728

UNDERGROUND FACILITY LOCATION SKETCH

Work Address 200 W 48TH Contact Name PAUL

Contractor Name Knight Piesold & Co Contact Phone # 303-229-5823

~~Billing Address~~ 1050 17TH ST Suite 500 Type of Work PRIVATE

City/State/Zip DENVER, CO 80265-0500 Charge $ 2 HRS

Payment due on receipt of services

PO# 4707

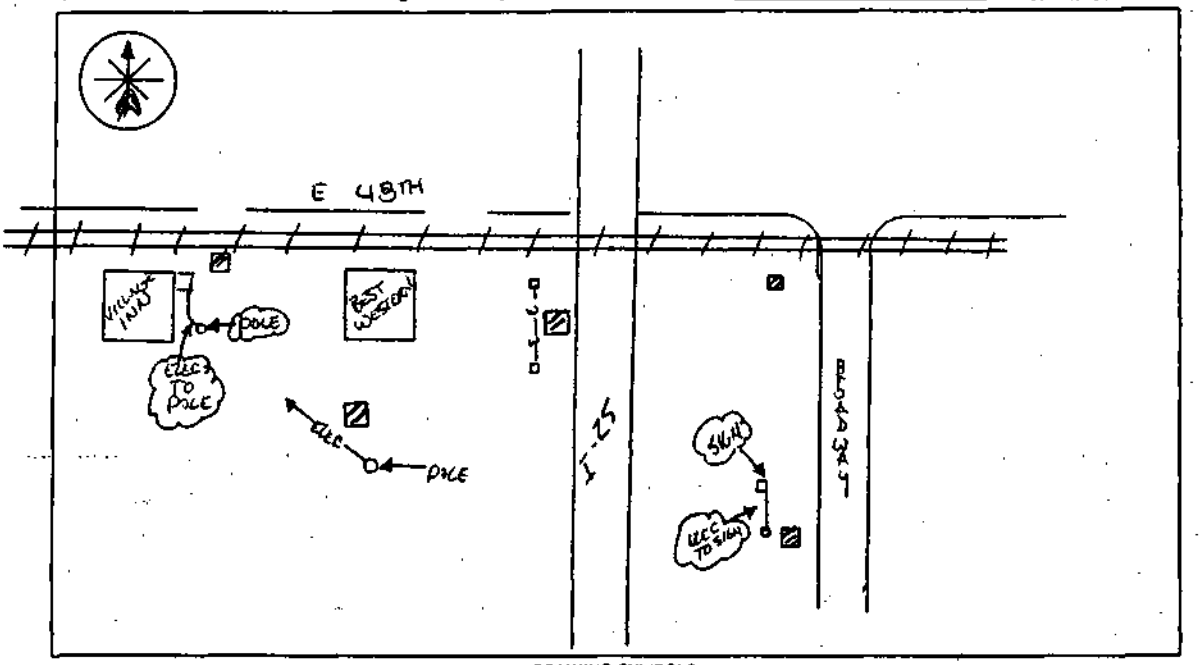
CALL BEFORE YOU DIG • • • ITS THE LAW

CAUTION: Private facilities may be present in dig area, check with property owner.

AREA	MEET TIME	TIME ARRIVED	TIME COMPLETED
	9:00	830	9:40

Please hand dig and expose all facilities before using mechanical devices near underground facilities. Thank You!

How Marked: ☒ Paint ☒ Flags ☐ Nylon Whiskers Print# _____



DRAWING SYMBOLS

DIG AREA		FENCE	
GAS		ELECTRIC	
PHONE		CATV	
WATER	W W W W W W W W	SEWER	S S S S S S S S

COLOR CODES:

Phone - Orange (2) Gas - Yellow (3) Electric - Red (4) Cable TV - Orange (5) Water - Blue (6) Sewer - Green

THIS SKETCH IS APPROXIMATE: 18 INCHES HORIZONTALLY FROM EXTERIOR SIDE OF THE FACILITY IS CONSIDERED A CORRECT LOCATION:

COMMENTS _____

LOCATOR'S NAME Tom Richardson DATE 4-7-04

Signature of person on Job site _____

EXTENDED JOB AGREEMENT

Our company and I agree that this original locate ticket is an extended job and that locates will be done on a day-to-day basis. No excavating will take place until signed paperwork is received by our Company with the dig area defined.

Excavators Signature

PRIVATE FACILITY LOCATE DISCLAIMER

I (x) Paul Bergstrom, as representative for Knight Piesold (Name of Company) Understand that this locate is being performed by electronic locating devices and that there are no guarantees, written or implied. Knight Piesold (Name of Company) shall indemnify and hold Diversified Underground, Inc. its clients, its agents, employees, all persons claiming hereunder harmless from and against any and all claims, damage, losses and expenses, including attorney's fee, relating to, arising out of, or resulting from the performance of the work, or the accuracy of the locate itself.

x Tom Richardson
Diversified Underground, Inc.

x Paul W Bergstrom

Company: Knight Piesold

Appendix B

Information Filed with Colorado State Engineer's Office

GWS-61
03/01

NOTICE OF INTENT TO CONSTRUCT MONITORING HOLE(S)

Please type or print legibly in black ink

Well Owner's Name U.S. Environmental Protection Agency
Landowner's Name Salvation Army

Mailing Address: (Authorized Individual/or Driller)
Contact Phillip T. Kangas
Company Kumar and Associates, Inc.
Address 2390 South Lipan Street
City, State, Zip Denver, CO 80223

Phone 303-742-9700 Fax No. 303-742-9666

Driller Lic. No. (if applicable) N/A

Location: NE ¼, NW ¼, Section 22,
Township 3 N/(S) Range 68 E/(W) 6 PM
County Denver
Subdivision _____,
Lot _____, Blk _____, Flg _____

Hole(s) to be Constructed: Number 2
Estimated Depth 15 Ft. Aquifer Alluvial
Purpose of Monitoring Hole(s) Water Quality Sampling
Approximate Date of Construction 4/8/04

X Phillip T. Kangas
Authorized Signature

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE

FOR OFFICE USE ONLY

MH- _____

DIV. _____ WD _____ BAS ____ MD ____

PROCESSED BY _____

DATE ACKNOWLEDGED _____

GROUND ELEV _____ USGS MAP # _____

CONDITIONS OF MONITORING HOLE ACKNOWLEDGEMENT

A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMENT SHALL BE AVAILABLE AT THE DRILLING SITE.

Notice was provided to the State Engineer at least 3 days prior to construction of monitoring & observation hole(s).

Construction of the hole(s) must be completed within 90 days of the date notice was given to the State Engineer.

Testing and/or pumping shall not exceed a total of 200 hours unless prior written approval is obtained from the State Engineer.

Water diverted during testing shall not be used for beneficial purposes. The owner of the hole(s) is responsible for obtaining permit(s) and complying with all rules and regulations pertaining to the discharge of fluids produced during testing.

All work must comply with the Water Well Construction Rules, 2 CCR 402-2. Minimum construction standards must be met or a variance obtained.

Well Construction and Test Reports (GWS-31) must be submitted to this office by the licensed contractor or authorized individual within 60 days of the completion of the work.

Unless a well permit is obtained, the hole(s) must be plugged and sealed within one (1) year after construction. An Abandonment Report (form GWS-9) must be submitted within 60 days of plugging & sealing.

The owner of the hole(s) should maintain records of water quality testing and submit this data to the State Engineer upon request.

The monitoring hole number, owner's structure name, and hole owner's name and address must be provided on all well permit application(s), well construction and abandonment reports.

A monitoring hole cannot be converted to a production water well, except for purposes of remediation (recovery) or as a permanent dewatering system, if constructed in accordance with the Water Well Construction Rules and policies of the State Engineer.

THIS ACKNOWLEDGEMENT OF NOTICE DOES NOT INDICATE THAT WELL PERMIT(S) CAN BE APPROVED.

Additional Conditions _____

GWS-51
03/01

NOTICE OF INTENT TO CONSTRUCT MONITORING HOLE(S)

Please type or print legibly in black ink

Well Owner's Name U.S. Environmental Protection Agency
Landowner's Name Vicorp

Mailing Address: (Authorized Individual/or Driller)
Contact Phillip T. Kangas
Company Kumar and Associates, Inc.
Address 2390 South Lipan Street
City, State, Zip Denver, CO 80223

Phone 303-742-9700 Fax No. 303-742-9666

Driller Lic. No. (if applicable) N/A

Location: NE ¼, NW ¼, Section 22,
Township 3 N/S Range 68 E/W 6 PM
County Denver
Subdivision _____,
Lot _____, Blk _____, Flg _____

Hole(s) to be Constructed: Number 2
Estimated Depth 20 Ft. Aquifer Alluvial
Purpose of Monitoring Hole(s) Water quality sampling
Approximate Date of Construction 4/8/04

Phillip T. Kangas
Authorized Signature

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE

FOR OFFICE USE ONLY

MH- _____

Div. _____ WD _____ Bas _____ MD _____

PROCESSED BY _____

DATE ACKNOWLEDGED _____

GROUND ELEV _____ USGS MAP # _____

CONDITIONS OF MONITORING HOLE ACKNOWLEDGEMENT

A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMENT SHALL BE AVAILABLE AT THE DRILLING SITE.

Notice was provided to the State Engineer at least 3 days prior to construction of monitoring & observation hole(s).
Construction of the hole(s) must be completed within 90 days of the date notice was given to the State Engineer.
Testing and/or pumping shall not exceed a total of 200 hours unless prior written approval is obtained from the State Engineer.
Water diverted during testing shall not be used for beneficial purposes. The owner of the hole(s) is responsible for obtaining permit(s) and complying with all rules and regulations pertaining to the discharge of fluids produced during testing.
All work must comply with the Water Well Construction Rules, 2 CCR 402-2. Minimum construction standards must be met or a variance obtained.
Well Construction and Test Reports (GWS-31) must be submitted to this office by the licensed contractor or authorized individual within 60 days of the completion of the work.
Unless a well permit is obtained, the hole(s) must be plugged and sealed within one (1) year after construction. An Abandonment Report (form GWS-9) must be submitted within 60 days of plugging & sealing.
The owner of the hole(s) should maintain records of water quality testing and submit this data to the State Engineer upon request.
The monitoring hole number, owner's structure name, and hole owner's name and address must be provided on all well permit application(s), well construction and abandonment reports.
A monitoring hole cannot be converted to a production water well, except for purposes of remediation (recovery) or as a permanent dewatering system, if constructed in accordance with the Water Well Construction Rules and policies of the State Engineer.
THIS ACKNOWLEDGEMENT OF NOTICE DOES NOT INDICATE THAT WELL PERMIT(S) CAN BE APPROVED.

Additional Conditions _____

GWS-51
03/01

NOTICE OF INTENT TO CONSTRUCT MONITORING HOLE(S)

Please type or print legibly in black ink

Well Owner's Name U.S. Environmental Protection Agency
Landowner's Name Best Western

Mailing Address: (Authorized Individual/or Driller)
Contact Phillip T. Kangas
Company Kumar and Associates, Inc.
Address 2390 South Lipan Street
City, State, Zip Denver, CO 80223

Phone 303-742-9700 Fax No. 303-742-9666

Driller Lic. No. (if applicable) N/A

Location: NE ¼, NW ¼, Section 22,
Township 3 N/S Range 68 E/W 6 PM
County Denver
Subdivision _____,
Lot _____, Blk _____, Flg _____

Hole(s) to be Constructed: Number 1
Estimated Depth 20 Ft. Aquifer Alluvial
Purpose of Monitoring Hole(s) Water quality sampling
Approximate Date of Construction 4/8/04

Phillip T. Kangas
Authorized Signature

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE

FOR OFFICE USE ONLY

MH-_____ PROCESSED BY _____

DIV. _____ WD _____ BAS _____ MD _____ DATE ACKNOWLEDGED _____

GROUND ELEV _____ USGS MAP # _____

CONDITIONS OF MONITORING HOLE ACKNOWLEDGEMENT

A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMENT SHALL BE AVAILABLE AT THE DRILLING SITE.

Notice was provided to the State Engineer at least 3 days prior to construction of monitoring & observation hole(s).
Construction of the hole(s) must be completed within 90 days of the date notice was given to the State Engineer.
Testing and/or pumping shall not exceed a total of 200 hours unless prior written approval is obtained from the State Engineer.
Water diverted during testing shall not be used for beneficial purposes. The owner of the hole(s) is responsible for obtaining permit(s) and complying with all rules and regulations pertaining to the discharge of fluids produced during testing.
All work must comply with the Water Well Construction Rules, 2 CCR 402-2. Minimum construction standards must be met or a variance obtained.
Well Construction and Test Reports (GWS-31) must be submitted to this office by the licensed contractor or authorized individual within 60 days of the completion of the work.
Unless a well permit is obtained, the hole(s) must be plugged and sealed within one (1) year after construction. An Abandonment Report (form GWS-9) must be submitted within 60 days of plugging & sealing.
The owner of the hole(s) should maintain records of water quality testing and submit this data to the State Engineer upon request.
The monitoring hole number, owner's structure name, and hole owner's name and address must be provided on all well permit application(s), well construction and abandonment reports.
A monitoring hole cannot be converted to a production water well, except for purposes of remediation (recovery) or as a permanent dewatering system, if constructed in accordance with the Water Well Construction Rules and policies of the State Engineer.
THIS ACKNOWLEDGEMENT OF NOTICE DOES NOT INDICATE THAT WELL PERMIT(S) CAN BE APPROVED.

Additional Conditions _____

FORM NO. GWS-31 10/94

WELL CONSTRUCTION AND TEST REPORT
STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Rm 818, Denver, CO 80203

For Office Use only

1. WELL PERMIT NUMBER MH-43382 (MW-32)

2. OWNER NAME(S) Environmental Protection Agency
Mailing Address 999 18th Street, Suite 300
City, St. Zip Denver, CO 80202
Phone (303) 312-6312

3. WELL LOCATION AS DRILLED: NW 1/4 NW 1/4, Sec. 22 Twp. 3 S, Range 68 W
DISTANCES FROM SEC. LINES:
200 ft. from N (north or south) Sec. line. and 1000 ft. from W (east or west) Sec. line. OR
SUBDIVISION: LOT BLOCK FILING(UNIT)
STREET ADDRESS AT WELL LOCATION:

4. GROUND SURFACE ELEVATION 5207.93 ft. DRILLING METHOD Direct Push Probe
DATE COMPLETED 4/8/04 TOTAL DEPTH 15 ft. DEPTH COMPLETED 13 ft.

5. GEOLOGIC LOG:

Depth	Description of Material (Type, Size, Color, Water Location)
0-7"	Fill - Asphalt
7"-5'	Fill - Sandy clays, dark brown
5'-15'	Weathered claystone, dusky yellow

6. HOLE DIAM. (in.)

From (ft)	To (ft)
0	15

7. PLAIN CASING

OD (in)	Kind	Wall Size	From(ft)	To(ft)
2"	PVC	Solid	0	3

PERF. CASING: Screen Slot Size:

2"	PVC	1/100	3	13

8. FILTER PACK:
Material Sand Silica
Size 10/20
Interval 3' to 13'

9. PACKER PLACEMENT:
Type Bentonite
Depth 10"-3'

10. GROUTING RECORD:

Material	Amount	Density	Interval	Placement

REMARKS:

11. DISINFECTION: Type Amt. Used

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form No. GWS 39 Supplemental Well Test.
TESTING METHOD
Static Level ft. Date/Time measured , Production Rate gpm.
Pumping level ft. Date/Time measured , Test length (hrs.)
Remarks

13. I have read the statements made herein and know the contents thereof, and that they are true to my knowledge. [Pursuant to Section 24-4-104 (13)(a) C.R.S., the making of false statements herein constitutes perjury in the second degree and is punishable as a class 1 misdemeanor.]

CONTRACTOR Kumar & Associates, Inc. Phone (303) 742-9200 Lic. No.
Mailing Address 2390 S. Lipan St. Denver, CO 80223

Name/Title (Please type or print)	Signature	Date
Derek Bowman / Project Manager		9/16/04

FORM NO. GWS-31 10/94

WELL CONSTRUCTION AND TEST REPORT
STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Rm 818, Denver, CO 80203

For Office Use only

1. WELL PERMIT NUMBER MH-43382 (MW-33)

2. OWNER NAME(S) Environmental Protection Agency
Mailing Address 999 18th Street, Suite 300
City, St. Zip Denver, CO 80202
Phone (303) 312-6312

3. WELL LOCATION AS DRILLED: NE 1/4 NW 1/4, Sec. 22 Twp. 3 S, Range 68 W
DISTANCES FROM SEC. LINES:
300 ft. from N (North or South) Sec. line. and 1600 ft. from W (East or West) Sec. line. OR
SUBDIVISION: _____ LOT ___ BLOCK ___ FILING(UNIT) ___
STREET ADDRESS AT WELL LOCATION:

4. GROUND SURFACE ELEVATION 5199.18 ft. DRILLING METHOD Direct Push Probe
DATE COMPLETED 4/8/04 TOTAL DEPTH 20 ft. DEPTH COMPLETED 18 ft.

5. GEOLOGIC LOG:

Depth	Description of Material (Type, Size, Color, Water Location)
0-6"	Asphalt
6"-2'	Fill, Sandy clay, dark brown
2'-17'	Sandy clays, brown
17'-20'	Weathered Claystone

REMARKS:

6. HOLE DIAM. (in.)

From (ft)	To (ft)
0	20

7. PLAIN CASING

OD (in)	Kind	Wall Size	From(ft)	To(ft)
2"	PVC	Slid	0	8

PERF. CASING: Screen Slot Size:

2"	PVC	1/100	8'	18'

8. FILTER PACK:
Material Silica Sand
Size 10/20
Interval 6' - 16'9"

9. PACKER PLACEMENT:
Type Bentonite
Depth 10" - 6'

10. GROUTING RECORD:

Material	Amount	Density	Interval	Placement

11. DISINFECTION: Type Amt. Used

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form No. GWS 39 Supplemental Well Test.
TESTING METHOD _____
Static Level _____ ft. Date/Time measured _____, Production Rate _____ gpm.
Pumping level _____ ft. Date/Time measured _____, Test length (hrs.) _____
Remarks _____

13. I have read the statements made herein and know the contents thereof, and that they are true to my knowledge. [Pursuant to Section 24-4-104 (13)(a) C.R.S., the making of false statements herein constitutes perjury in the second degree and is punishable as a class 1 misdemeanor.]

CONTRACTOR Kumar & Associates, Inc. Phone (303) 742-9700 Lic. No. ___
Mailing Address 2390 S. Lipan St. Denver, CO 80223

Name/Title (Please type or print)	Signature	Date
Derek Bowman / Project Manager		9/10/04

FORM NO. GWS-31 10/94

WELL CONSTRUCTION AND TEST REPORT
STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St. Rm 818, Denver, CO 80203

For Office Use only

1. WELL PERMIT NUMBER MH-43382 (MW-34)

2. OWNER NAME(S) Environmental Protection Agency
Mailing Address 999 18th Street, Suite 300
City, St. Zip Denver, CO 80202
Phone (303) 312-6312

3. WELL LOCATION AS DRILLED: NE 1/4 NW 1/4, Sec. 22 Twp. 3 S, Range 68 W
DISTANCES FROM SEC. LINES:
400 ft. from N (north or south) Sec. line. and 1500 ft. from W (east or west) Sec. line. OR
SUBDIVISION: LOT BLOCK FILING(UNIT)
STREET ADDRESS AT WELL LOCATION:

4. GROUND SURFACE ELEVATION ft. DRILLING METHOD Direct Push Probe
DATE COMPLETED 4/8/04 TOTAL DEPTH 21' 3" ft. DEPTH COMPLETED 21' 3" ft.

5. GEOLOGIC LOG:

Depth	Description of Material (Type, Size, Color, Water Location)
0-7'	Fill, Clayey sand
7' - 16'	Silty sand, Yellowish orange
16' - 20' 2"	Gravelly sands, slightly moist, orange pink to light brown
20' 2" - 21' 3"	Weathered Claystone

6. HOLE DIAM. (in.)

From (ft)	To (ft)
0	21' 3"

7. PLAIN CASING

OD (in)	Kind	Wall Size	From(ft)	To(ft)
2	PVC	Solid	0	11

PERF. CASING: Screen Slot Size:

2	PVC	1/100	11	21'3"

8. FILTER PACK:
Material Silica Sand
Size 10/20
Interval 9'2" - 21'3"

9. PACKER PLACEMENT:
Type Bentonite
Depth 6' - 9'3"

10. GROUTING RECORD:

Material	Amount	Density	Interval	Placement

REMARKS:

11. DISINFECTION: Type Amt. Used

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form No. GWS 39 Supplemental Well Test.
TESTING METHOD
Static Level ft. Date/Time measured , Production Rate gpm.
Pumping level ft. Date/Time measured , Test length (hrs.)
Remarks

13. I have read the statements made herein and know the contents thereof, and that they are true to my knowledge. (Pursuant to Section 24-4-104 (13)(a) C.R.S., the making of false statements herein constitutes perjury in the second degree and is punishable as a class 1 misdemeanor.)

CONTRACTOR Kumar & Associates, Inc. Phone (303) 741-4700 Lic. No.
Mailing Address 2390 S. Lipan St. Denver, CO 80223

Name/Title (Please type or print)	Signature	Date
Derek Berman / Project Manager		9/16/04

FORM NO. GWS-31 10/94

WELL CONSTRUCTION AND TEST REPORT
STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Rm 818, Denver, CO 80203

For Office Use only

1. WELL PERMIT NUMBER MH-43382 (MW-35)

2. OWNER NAME(S) Environmental Protection Agency
Mailing Address 999 18th Street, Suite 300
City, St. Zip Denver, CO 80202
Phone (303) 312-6312

3. WELL LOCATION AS DRILLED: NE 1/4 NW 1/4, Sec. 22 Twp. 3 S, Range 68 W
DISTANCES FROM SEC. LINES:
SD ft. from N (North or South) Sec. line. and 2600 ft. from W (East or West) Sec. line. OR
SUBDIVISION: LOT BLOCK FILING(UNIT)
STREET ADDRESS AT WELL LOCATION:

4. GROUND SURFACE ELEVATION ft. DRILLING METHOD Direct Push Probe
DATE COMPLETED 4/8/04 TOTAL DEPTH 14 ft. DEPTH COMPLETED 12 ft.

5. GEOLOGIC LOG:

Depth	Description of Material (Type, Size, Color, Water Location)
0-4"	Asphalt
4"-2'	Sandy, dark brown
2'-10'	Sands, gravelly sands, moderate yellowish brown
10'-14	Weathered claystone

REMARKS:

6. HOLE DIAM. (in.)

	From (ft)	To (ft)
2"	0	14

7. PLAIN CASING

OD (in)	Kind	Wall Size	From(ft)	To(ft)
2	PVC	Solid	0	7'

PERF. CASING: Screen Slot Size:

2	PVC	1/100	7	12

8. FILTER PACK:
Material Silica Sand
Size 10/20
Interval 5' - 12'

9. PACKER PLACEMENT:
Type Bentonite
Depth 0 - 5'

10. GROUTING RECORD:

Material	Amount	Density	Interval	Placement

11. DISINFECTION: Type Amt. Used

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form No. GWS 39 Supplemental Well Test.
TESTING METHOD
Static Level ft. Date/Time measured , Production Rate gpm.
Pumping level ft. Date/Time measured , Test length (hrs.)
Remarks

13. I have read the statements made herein and know the contents thereof, and that they are true to my knowledge. [Pursuant to Section 24-4-104 (13)(a) C.R.S., the making of false statements herein constitutes perjury in the second degree and is punishable as a class 1 misdemeanor.]

CONTRACTOR Kumar & Associates, Inc. Phone (303) 741-9700 Lic. No.
Mailing Address 2390 S. Lipan St. Denver, CO 80223

Name/Title (Please type or print)	Signature	Date
Derek Bauman / Project Manager		9/16/04

FORM NO. GWS-31 10/94

WELL CONSTRUCTION AND TEST REPORT
STATE OF COLORADO, OFFICE OF THE STATE ENGINEER
1313 Sherman St., Rm 818, Denver, CO 80203

For Office Use only

1. WELL PERMIT NUMBER MH-43382 (MW-36)

2. OWNER NAME(S) Environmental Protection Agency
Mailing Address 999 18th Street, Suite 300
City, St. Zip Denver, CO 80202
Phone (303) 312-6312

3. WELL LOCATION AS DRILLED: NE 1/4 NW 1/4, Sec. 22 Twp. 3 S, Range 68 W
DISTANCES FROM SEC. LINES:
800 ft. from N (North or South) Sec. line, and 2600 ft. from W (East or West) Sec. line, OR
SUBDIVISION: LOT BLOCK FILING(UNIT)
STREET ADDRESS AT WELL LOCATION:

4. GROUND SURFACE ELEVATION ft. DRILLING METHOD Direct Push Probe
DATE COMPLETED 4/8/04 TOTAL DEPTH 10 ft. DEPTH COMPLETED 10 ft.

5. GEOLOGIC LOG:

Depth	Description of Material (Type, Size, Color, Water Location)
0-3"	Topsoil
3"-6'	Fill, clayey sand, iron staining
6'-8'	Gravelly sand, slightly moist
8'-10'	Weathered claystone

REMARKS:

6. HOLE DIAM. (in.)

	From (ft)	To (ft)
2"	0	10

7. PLAIN CASING

OD (in)	Kind	Wall Size	From(ft)	To(ft)
2	PVC	Solid	0	5

PERF. CASING: Screen Slot Size:

2	PVC	1/100	5	10

8. FILTER PACK:
Material
Size
Interval

9. PACKER PLACEMENT:
Type
Depth

10. GROUTING RECORD:

Material	Amount	Density	Interval	Placement

11. DISINFECTION: Type Amt. Used

12. WELL TEST DATA: ☐ Check box if Test Data is submitted on Form No. GWS 39 Supplemental Well Test.
TESTING METHOD
Static Level ft. Date/Time measured , Production Rate gpm.
Pumping level ft. Date/Time measured , Test length (hrs.)
Remarks

13. I have read the statements made herein and know the contents thereof, and that they are true to my knowledge. [Pursuant to Section 24-4-104 (13)(a) C.R.S., the making of false statements herein constitutes perjury in the second degree and is punishable as a class 1 misdemeanor.]

CONTRACTOR Kumar & Associates, Inc. Phone (303) 741-4700 Lic. No.
Mailing Address 2390 S. Lipan St. Denver, CO 80223

Name/Title (Please type or print)	Signature	Date
Derek Bowman / Project Manager		9/16/04

Appendix C

Survey Data

Date 5/10/04

SURVEY DATA REPORT

Project MONITOR WELL SURVEY – ARGO SMELTER PROJECT

Prepared for KNIGHT PIESOLD Compiled by HKJ

STATE PLANE-CENTRAL ZONE

POINT	NORTHING	EASTING	N. RIM ELEV.	PVC ELEV.	DESCRIPTION
MW-32	1710581.51	3142892.43	5207.93	5207.57	2" PVC IN 6" FLUSH MOUNT
MW-33	1710322.68	3143032.19	5199.18	5198.67	2" PVC IN 6" FLUSH MOUNT
MW-34	1710567.32	3143346.23	5200.06 *	TOP LID	4" DIA STICK UP
MW-35	1710792.03	3143934.39	5178.74	5178.32	2" PVC IN 6" FLUSH MOUNT
MW-36	1710364.20	3143986.44	5175.32	5174.93	2" PVC IN 6" FLUSH MOUNT

* MW-34 LID IS LOCKED, SURVEYED ELEVATION ON TOP OF LID AND AT THE BASE OF THE WELL, ELEVATION AT THE BASE IS 5199.15'

STANDARD OF ACCURACY MAINTAINED IN DEVELOPING THE STATE PLANE COORDINATES SHOWN HEREON: ORDER C 2-1 (1:50,000), AS SPECIFIED IN "GEOMETRIC GEODETIC ACCURACY STANDARDS AND SPECIFICATIONS FOR USING GPS RELATIVE POSITIONING TECHNIQUES, PRINTED BY THE FEDERAL GEODETIC CONTROL COMMITTEE AUGUST 1, 1989.

Coordinate System: COLORADO COORD. SYSTEM OF 1983(92)
CENTRAL ZONE, US SURVEY FEET

Elevation Datum: BASED ON NGS BENCHMARK "B 394",
ELEVATION: 5261.82 FEET NAVD 88

File Name: C:\ACTIVE\KNIGHT-PIESOLD\ARGO\ARGO.DWG

Date Of Survey: 5-6-04

Surveyed: DEA-JCH

Project No.

12424 E. Weaver Place, Suite 100
Englewood, CO 80111 (303) 504-4440

COLORADO REGISTERED PROFESSIONAL LAND SURVEYOR
H. K. JOHNSTON
33198
5/10/04

Date 5/10/04

SURVEY DATA REPORT

Project MONITOR WELL SURVEY – ARGO SMELTER PROJECT

Prepared for KNIGHT PIESOLD Compiled by HKJ

STATE PLANE-NORTH ZONE

POINT	NORTHING	EASTING	N. RIM ELEV.	PVC ELEV.	DESCRIPTION
MW-32	1164302.88	3142889.99	5207.93	5207.57	2" PVC IN 6" FLUSH MOUNT
MW-33	1164044.07	3143029.78	5199.18	5198.67	2" PVC IN 6" FLUSH MOUNT
MW-34	1164288.75	3143343.78	5200.06 *	TOP LID	4" DIA STICK UP
MW-35	1164513.54	3143931.90	5178.74	5178.32	2" PVC IN 6" FLUSH MOUNT
MW-36	1164085.72	3143984.01	5175.32	5174.93	2" PVC IN 6" FLUSH MOUNT

* MW-34 LID IS LOCKED, SURVEYED ELEVATION ON TOP OF LID AND AT THE BASE OF THE WELL, ELEVATION AT THE BASE IS 5199.15'

STANDARD OF ACCURACY MAINTAINED IN DEVELOPING THE STATE PLANE COORDINATES SHOWN HEREON: ORDER C 2-1 (1:50,000), AS SPECIFIED IN "GEOMETRIC GEODETIC ACCURACY STANDARDS AND SPECIFICATIONS FOR USING GPS RELATIVE POSITIONING TECHNIQUES, PRINTED BY THE FEDERAL GEODETIC CONTROL COMMITTEE AUGUST 1, 1989.

Coordinate System: COLORADO COORD. SYSTEM OF 1983(92) NORTH ZONE, US SURVEY FEET

Elevation Datum: BASED ON NGS BENCHMARK "B 394", ELEVATION: 5261.82 FEET NAVD 88

File Name: C:\ACTIVE\KNIGHT-PIESOLD\ARGO\ARGO.DWG

Date Of Survey: 5-6-04

Surveyed: DEA-JCH

Project No.

12424 E. Weaver Place, Suite 100
Englewood, CO 80111 (303) 504-4440

COLORADO REGISTERED H. K. JOHNSTON 33198 PROFESSIONAL LAND SURVEYOR 5/10/04

Date 5/10/04

SURVEY DATA REPORT

Project MONITOR WELL SURVEY – ARGO SMELTER PROJECT

Prepared for KNIGHT PIESOLD Compiled by HKJ

POINT	LATITUDE(N)	LONGITUDE(W)	N. RIM ELEV.	PVC ELEV.	DESCRIPTION
MW-32	39.7832558	104.9915715	5207.93	5207.57	2" PVC IN 6" FLUSH MOUNT
MW-33	39.7825432	104.9910793	5199.18	5198.67	2" PVC IN 6" FLUSH MOUNT
MW-34	39.7832099	104.9899571	5200.06 *	TOP LID	4" DIA STICK UP
MW-35	39.7838177	104.9878599	5178.74	5178.32	2" PVC IN 6" FLUSH MOUNT
MW-36	39.7826424	104.9876833	5175.32	5174.93	2" PVC IN 6" FLUSH MOUNT

* MW-34 LID IS LOCKED, SURVEYED ELEVATION ON TOP OF LID AND AT THE BASE OF THE WELL, ELEVATION AT THE BASE IS 5199.15'

STANDARD OF ACCURACY MAINTAINED IN DEVELOPING THE GEOGRAPHIC COORDINATES SHOWN HEREON: ORDER C 2-1 (1:50,000), AS SPECIFIED IN "GEOMETRIC GEODETIC ACCURACY STANDARDS AND SPECIFICATIONS FOR USING GPS RELATIVE POSITIONING TECHNIQUES, PRINTED BY THE FEDERAL GEODETIC CONTROL COMMITTEE AUGUST 1, 1989.

Coordinate System: GEOGRAPHIC COORDINATES 1983(92)

Elevation Datum: BASED ON NGS BENCHMARK "B 394", ELEVATION: 5261.82 FEET NAVD 88

File Name: C:\ACTIVE\KNIGHT-PIESOLD\ARGO\ARGO.DWG

Date Of Survey: 5-6-04

Surveyed: DEA-JCH

Project No.

12424 E. Weaver Place, Suite 100
Englewood, CO 80111 (303) 504-4440

COLORADO REGISTERED PROFESSIONAL LAND SURVEYOR
H. K. JOHNSTON
33198
5/10/04

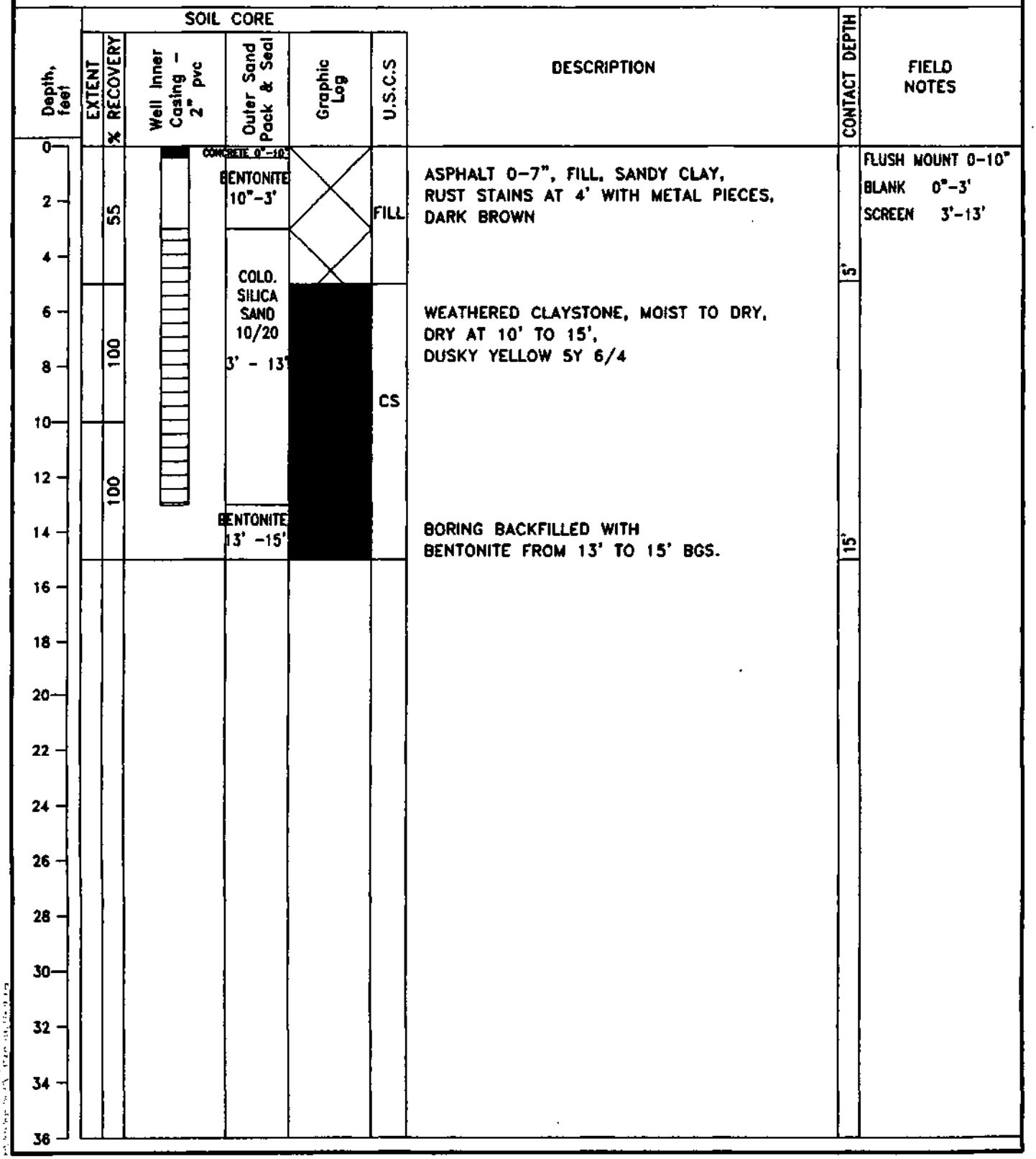
Appendix D

Boring Logs and Well Construction Diagrams

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 04-1-247	Boring No: MW-32	Sheet 1 of 1	
Boring Location: Village Inn Parking Lot		Start Date: 04/08/04	Completion Date: 04/08/04		
Driller: Dustin / Kyle	Rig Type: DIRECT PUSH	Ground Elev: 5207.93	NORTHING	EASTING	
Logged By: Derek Bowman		Water Depth: Not Encountered	1710581.51	3142892.43	



SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 04-1-247	Boring No: MW-33	Sheet 1 of 1	
Boring Location: SOUTH SIDE OF BEST WESTERN		Start Date: 04/08/04	Completion Date: 04/08/04		
Driller: Dustin / Kyle	Rig Type: DIRECT PUSH	Ground Elev: 5199.18	NORTHING	EASTING	
Logged By: Derek Bowman		Water Depth: 16' 6"	1710322.68	3143032.19	

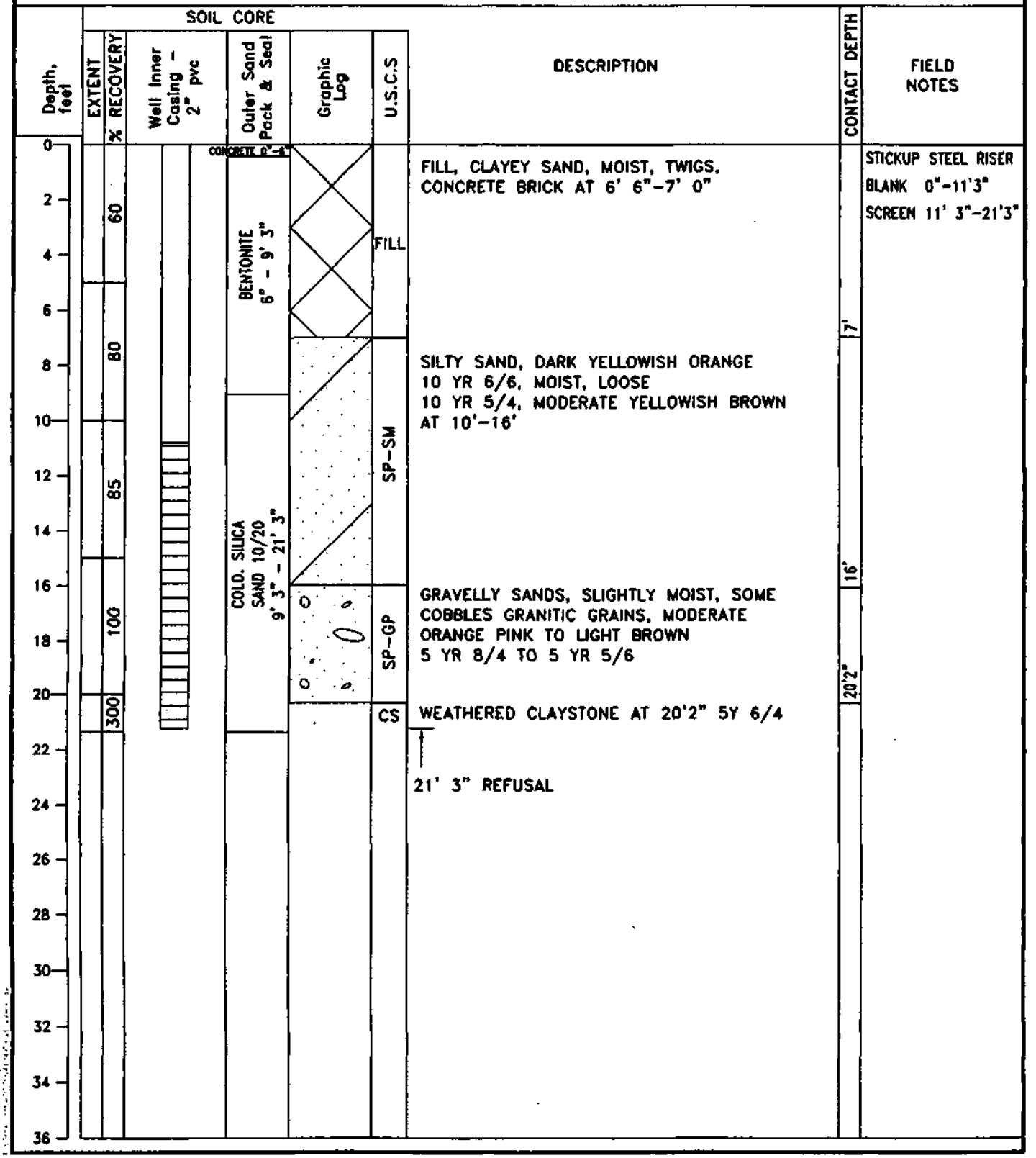
SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Well Inner Casing - 2" pvc	Outer Sand Pack & Seal	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0				CONCRETE 0"-10"			ASPHALT 0-6"		FLUSH MOUNT 0-10"
2	0 - 5	65				FILL	FILL, SANDY CLAY, DARK BROWN	2'	BLANK 0'-8'
4				BENTONITE 10" - 6'		SC	CLAYEY SAND, DARK BROWN, 10YR 4/2, MOIST	4'	SCREEN 8' TO 18'
6	5 - 10	75							
8						SP-SM	SILTY SAND, DRY TO MOIST, 10YR 7/4 LOOSE		
10									
12	10 - 15	80		COLO. SILICA SAND 10/20 6' - 16' 9"					
14								15'	
16						SP-GP	GRAVELLY SAND, MOIST TO WET, PINK, 5YR 8/4 GRANITIC GRAINS	16'6"	
18	15 - 20	100		COLLAPSED 16'9"-18'		CS	GROUND WATER DEPTH MEASURED AT 16' 6"		
20				BENTONITE 18'-20'			WEATHERED CLAYSTONE, LIGHT OLIVE BROWN. 5 YR 5/6		
22									
24									
26									
28									
30									
32									
34									
36									

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 04-1-247		Boring No: MW-34	Sheet 1 of 1
Boring Location: EAST OF BEST WESTERN		Start Date: 04/08/04		Completion Date: 04/08/04	
Driller: Dustin / Kyle	Rig Type: DIRECT PUSH	Ground Elev: 5199.15		NORTHING 1710567.32	EASTING 3143346.23
Logged By: Derek Bowman		Water Depth: Not Encountered			

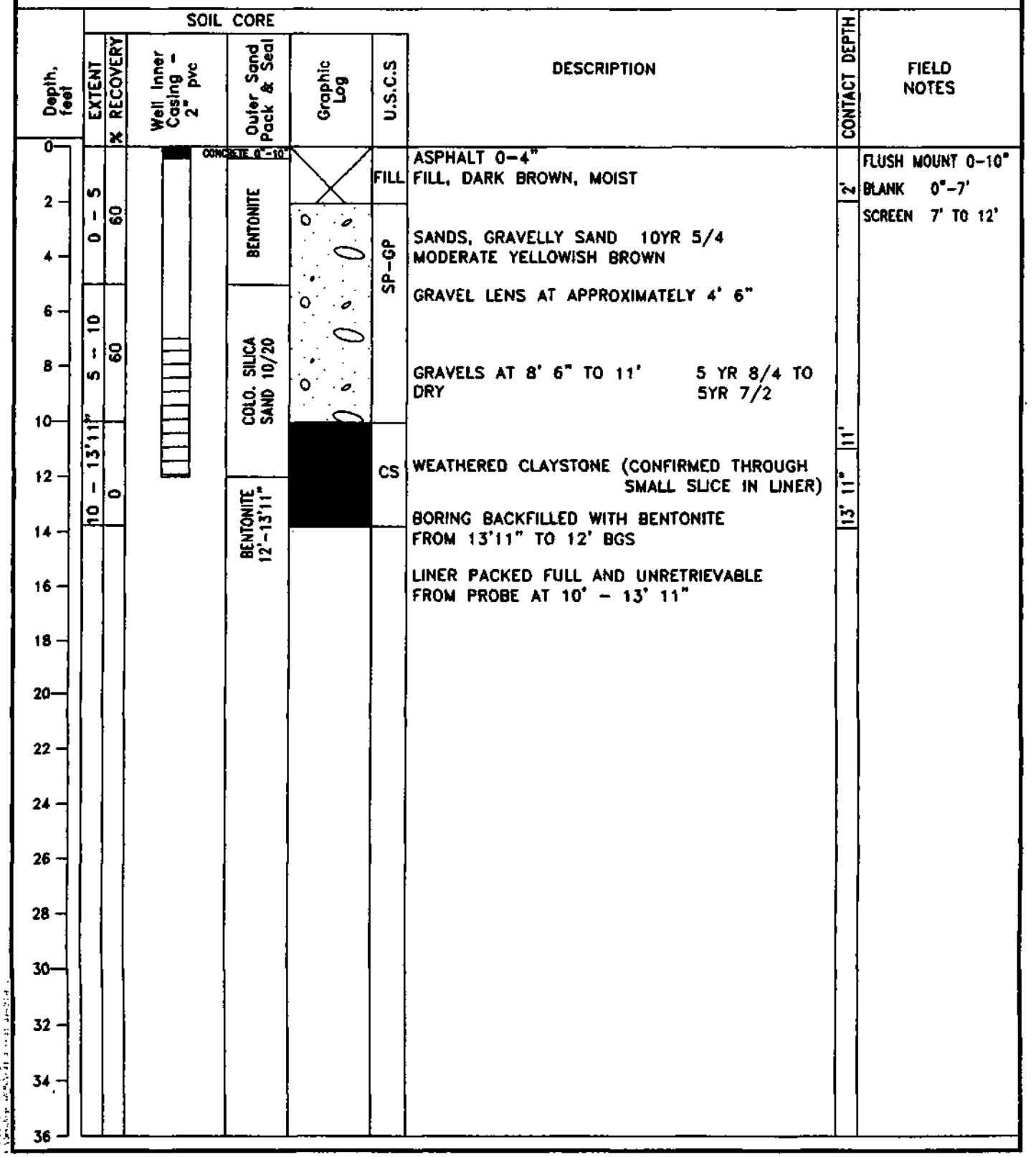


DESCRIPTION	CONTACT DEPTH	FIELD NOTES
FILL, CLAYEY SAND, MOIST, TWIGS, CONCRETE BRICK AT 6' 6"-7' 0"	7'	STICKUP STEEL RISER BLANK 0"-11'3" SCREEN 11' 3"-21'3"
SILTY SAND, DARK YELLOWISH ORANGE 10 YR 6/6, MOIST, LOOSE 10 YR 5/4, MODERATE YELLOWISH BROWN AT 10'-16'	16'	
GRAVELLY SANDS, SLIGHTLY MOIST, SOME COBBLES GRANITIC GRAINS, MODERATE ORANGE PINK TO LIGHT BROWN 5 YR 8/4 TO 5 YR 5/6	20'2"	
WEATHERED CLAYSTONE AT 20'2" 5Y 6/4		
21' 3" REFUSAL		

SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 04-1-247	Boring No: MW-35	Sheet 1 of 1	
Boring Location: N.E. CORNER SALVATION ARMY		Start Date: 04/08/04	Completion Date: 04/08/04		
Driller: Dustin / Kyle	Rig Type: DIRECT PUSH	Ground Elev: 5178.74	NORTHING	EASTING	
Logged By: Derek Bowman		Water Depth: Not Encountered	1710792.03	3143934.39	



SOIL BORING LOG

KUMAR & ASSOCIATES

Project Name: VB & I-70		Project No. 04-1-247	Boring No: MW-36	Sheet 1 of 1	
Boring Location: S.E. CORNER SALVATION ARMY		Start Date: 04/08/04	Completion Date: 04/08/04		
Driller: Dustin / Kyle	Rig Type: DIRECT PUSH	Ground Elev: 5175.32	NORTHING	EASTING	
Logged By: Derek Bowman		Water Depth: Not Encountered	1710364.20	3143986.44	

SOIL CORE

Depth, feet	EXTENT	% RECOVERY	Well Inner Casing - 2" pvc	Outer Sand Pack & Seal	Graphic Log	U.S.C.S	DESCRIPTION	CONTACT DEPTH	FIELD NOTES
0	0 - 5	65		CONCRETE 0"-10"			TOPSOIL 0-3"		FLUSH MOUNT 0-10"
2				BENTONITE 10"-2'6"		FILL	CLAYEY SAND, IRON STAINING, MINERALIZATION, 10YR 6/2 TO 10YR 4/2		BLANK 0"-4'6"
4				COLO. SILICA SAND 10/20 2'6" - 9'6"					SCREEN 4'6" TO 9'6"
6	5 - 10	100				SP-GP	GRAVELLY SANDS, SLIGHTLY MOIST 5 YR 8/4 TO 5 YR 7/2	6'	
8						CS	WEATHERED CLAYSTONE, LIGHT OLIVE GRAY 5Y 5/2	8'	
10								9'6"	
12									
14									
16									
18									
20									
22									
24									
26									
28									
30									
32									
34									
36									

Appendix E

CD-ROM: Analytical Data, Reports, Electronic Data Spreadsheets, and Site Photograph Files

TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 2023307

SITE NAME: VASQUEZ/INTERSTATE 70

DOCUMENT DATE: 09/13/2004

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☐ OVERSIZED
- ☑ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ☐ TYPES OF DOCUMENTS NOT TO BE SCANNED
  (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

APPENDIX E CD-ROM: ANALYTICAL DATA, REPORTS ELECTRONIC DATA SPREADSHEETS, AND SITE PHOTOGRAPH FILES

Contact the Superfund Records Center to view available document.
(303) 312-6473